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VOLUME 47
NUMBER 2

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Published on the 15th of each month by

PALMERTON PUBLISHING COMPANY, INC.

Printing office,
East Stroudsburg, Pa.

Editorial and Advertising Offices,
250 West 57th St., New York City

Entered as Second Class Matter, October 20, 1933 at the Post Office at East Stroudsburg, Pa., under Act of March 3, 1879. Subscription Rates: Domestic, $2.00 a year; Canada, $2.50; Foreign, $3.00. Single copies up to 3 months old, 25 cents; over 3 months old, 50 cents. Telephone COlumbus 5-2923, 5-2924.

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The RUBBER AGE

VOL. 47, No. 2 MAY, 1940

Action of Ozone on Rubber

By DR. FRANCIS J. NORTON

Research Laboratory,
General Electric Company

The action of ozone on rubber exposed to light has been studied by Haushalter, Williams and Depew, and their results recorded in the literature. In the investigation reported by Dr. Norton herewith the action of ozone on rubber compositions, not exposed to direct light but under tension and compressions, was studied. As a result of this investigation Dr. Norton concludes that in order to specify the life of a rubber composition the mechanical stress as well as the ozone concentration in the surrounding atmosphere must be known. This investigation was first reported in the "General Electric Review" of February, 1940.—Editor.

SINCE the deterioration of rubber by corona discharge and by light may be related to ozone formation, it seemed of interest to study the action of ozone alone. It was soon found that the dominant factors were ozone concentration, time of exposure, and mechanical stress on the rubber. This effect of tension was noted by Haushalter *(1)* who was making corona tests with stretched rubber. Williams *(2)* in studying the oxidation of rubber exposed to light found that light can produce checking or cracking, probably by the formation of a small amount of ozone. The surface deterioration of rubber in sunlight under different mechanical stresses was studied by Depew *(3)*.

In the present investigation the action of ozone on rubber compositions, not exposed to direct light but under tension and compression, was studied by placing the specimens one at a time in a box 2½ by 3½ by 15 in. through which a stream of ozonized air or oxygen was passed. The box had glass sides to enable the action on the specimen to be observed.

Most of the tests were made with ordinary rubber electrical insulating tape, which has a rubber content of about 70 per cent by volume. This was cut into standard dumbbell shape 4.75 in. long with a cross section 0.028 by 0.25 in. (The narrow portion formed 1.25 in. of the total length.) The stress is calculated on the

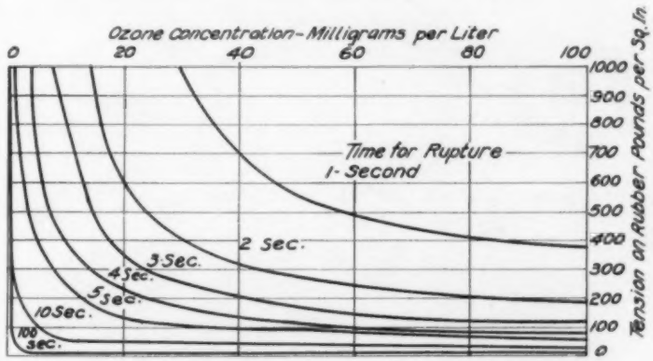


FIG. 1. Effect of ozone on rubber under stress. Test piece, semicured rubber; standard dumbbell shape; cross section 0.028 by 25 in.

[1] "Measuring Effects of Corona on Rubber," by F. L. Haushalter, *Electrical World*, Vol. 86, p. 267, August, 1925.
[2] "Oxidation of Rubber Exposed to Light," by Ira Williams, *Industrial and Engineering Chemistry*, Vol. 18, p. 367, April, 1926.
[3] "Surface Deterioration of Rubber," by H. A. Depew, *Industrial and Engineering Chemistry*, Vol. 24, p. 992, September, 1932.

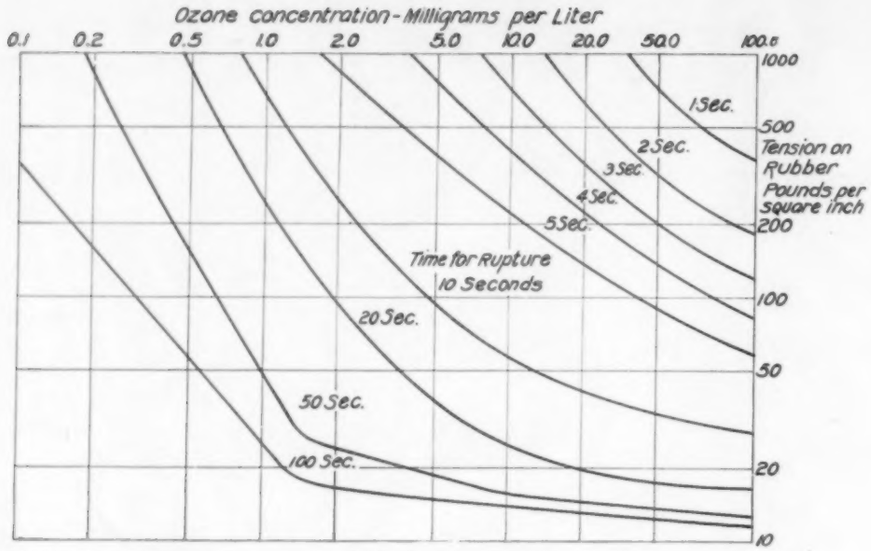


FIG. 2. Effect of ozone on rubber under stress. Test piece, semi-cured rubber; standard dumbbell shape; cross section 0.028 by 25 in.

original cross section. Its tensile strength was 1140 lb. per sq. in. at 650 per cent elongation. The ozone concentration in the box was determined by tests of the inlet and outlet air, and these checked. Analysis was made by absorbing a known volume of the gas in a 7 per cent KI, 1 per cent KOH solution. After the ozone had been absorbed (this action was extremely rapid), the solution was just acidified with H_2SO_4 and the iodine liberated by the ozone in the reaction

$$2\ KI + O_3 + H_2O = 2\ KOH + I_2 + O_2$$

was titrated with N/10 sodium thiosulfate.

The ozone was generated by a water-cooled ozonizer tube. This could give up to 4 per cent ozone by volume (75.5 mg per liter). The rate of flow was 9.6 liters per min. Since the box holding the specimen had a volume of 2.1 liters, there were about 4.5 complete changes of ozonized air in the box per minute.

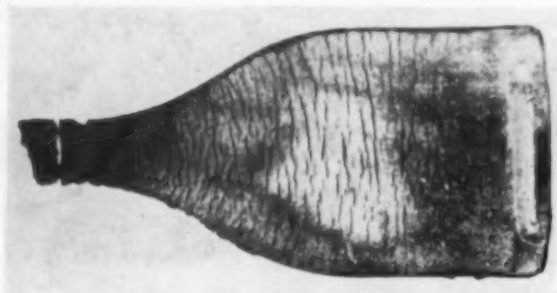


FIG. 3. Sheet rubber which has failed under tension and exposure to ozone.

FIG. 4. Block of rubber which has been stressed by bending and exposure to ozone.

FIG. 5. Rubber (top view of specimen in Fig. 4) which has failed under bending and exposure.

Method of Conducting Tension Tests

The mode of conducting the tension tests in ozone was first to clamp the upper end of the rubber strip and hang a weight on the lower end. The box was then closed and the ozonized air started through it. The time taken for the strip to break (and the weight to fall) was determined for various stresses and ozone concentrations. It is recognized that this method of testing a rubber sample under constant stress by suspending a weight on it is not representative of many actual service conditions. For example, a life test of corona-resisting rubber cable under service conditions should include a test with a sharp 90-degree bend. In such instances corona-resistant compounds will assume a permanent set, with a corresponding decrease in stress very difficult to calculate.

The results are presented by the curves in Fig. 1 on a linear scale and on a log-log scale in Fig. 2. It is of interest to note that the time to rupture depends on both stress and on ozone concentration. At very low stress, a very long time is required for the ozone to show any effect on the rubber; and presumably if zero stress could be attained, the ozone would be without effect on the rubber.

Various compositions of rubber were tested, including corona-resisting rubber, tellurium-cured rubber,

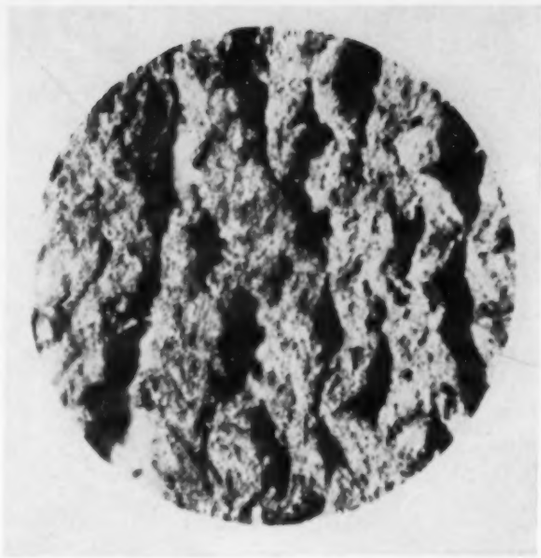


FIG. 6. Photomicrograph (× 25) of stretched rubber which has been exposed to ozone.

deproteinized rubber, and sheet rubber of different degrees of cure. All showed attack by ozone, to a greater or lesser extent. Corona-resisting rubber was the best in these comparative tests. However, it is difficult to extrapolate to actual service conditions, since the success of corona-resisting rubber insulation depends on its low modulus and high permanent set; and as previously mentioned, the consequent decrease in stress leads to much longer life in a given ozone concentration.

Hard-rubber sheet, 20 mils thick, stressed by being bent and put into the ozone, broke at the point of maximum stress in 15 seconds.

Synthetic materials which showed no evidence of ozone attack, either stressed or unstressed, were the alkyd, phenolic, and vinyl synthetic resins, and cellulose acetate.

During the action of concentrated ozone (44.5 mg per liter) the stressed rubber became warm. Rubber tape was wrapped around a thermometer bulb, the wrapping giving tensile stress. The temperature rose from 32° to 39°C in 30 seconds, when the rubber, disintegrating, fell away from the bulb.

Ozone Attack is Characteristic

The form of attack of ozone on rubber under tension is characteristic. Tiny cracks form, always at right angles to the direction of stress. The curved stress lines can be recognized in Fig. 3, where failure has occurred in the more highly stressed portion.

Fig. 4 shows the type of failure of a bent rubber bar ½ by ½ by 2 in., having tensile stress on the upper side. Fig. 5 shows a top view of the bar.

In a stretched specimen, failure is generally initiated from one of the little nicks on the edge started by ozone attack. If tension is uniform in all directions, as rubber stretched over a ball, failure starts as a reticular network. It looks like dried mud, but the five- or six-sided figures observed on a mud flat were not observed in the test of rubber.

The initial stage of attack can be observed under the microscope at 130-diameter magnification. Tiny round pinholes appear, then become isolated cracks at right angles to the tension. These then enlarge and interlace as shown in Figs. 3 and 6, leading to final rupture.

The rather different type of attack on deproteinized rubber is shown in Fig. 7.

Other Causes of Ozone Attack

It was found that accelerated attack on rubber by ozone is also caused when the rubber is under pure compressive, as well as tensile, stresses.

This is rather difficult to observe, because exposed portions of the specimen under tension disintegrate first. Satisfactory observation, however, was made as follows. A bar of rubber ½ by ½ by 2 in. was bent and held by a metal frame. All of the rubber was coated with Glyptal varnish except a small square on the interior of the bend. This is the one region under pure compression. The remainder of the bar, at the clamped ends, the neutral axis, and the top which was under tension, all were protected from ozone by the Glyptal.

Under these conditions it was found that the compressed portion was more rapidly attacked by ozone than was a nearby unstressed bar. The rubber appeared to sprout above the compressed surface as a black feathery disintegration product where the ozone attack occurred. Fig. 8 shows the appearance of the formation.

From this work it is apparent that attack by ozone is reduced by reduction in mechanical stress. This was taken advantage of in the design of a connection from glass to rubber tubing. The conventional joint, Fig. 9 *(a)*, produces a high stress in the rubber at the point of emergence from the glass tube. If the glass is necked down to the inner diameter of the rubber tube

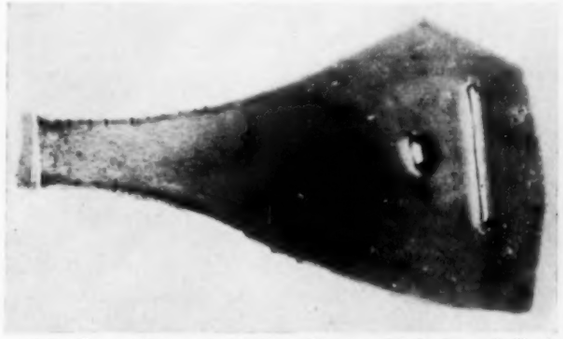


FIG. 7. Deproteinized rubber which has failed under tension and exposure to ozone.

FIG. 8. Rubber which is failing under compression and exposure to ozone.

and extended into it as in Fig. 9*(b)*, the point of high stress in the rubber is removed from the neighborhood of the ozone and is protected by the glass. Hence, the rubber tube lasts much longer. It is still better of course to use a tube of Glyptal for this material is unaffected by ozone.

Summary of the Investigation

This investigation may then be summarized as follows. Various rubber compositions were tested in ozone of varying concentrations by hanging a weight on a test strip to give a constant known stress, and the time for the strip to break was measured. It was found that at high stresses, even low ozone concentrations will result in short life of the rubber, whereas at very low stresses even high ozone concentrations do not affect this material.

Rubber is rapidly attacked when under tension or compression. Though attacked to different degrees, hard rubber, corona-resisting rubber, deproteinized rubber, and tellurium-cured rubber showed the same general type of relations between stress, ozone concentration, and time to rupture. The alkyd, phenolic, and vinyl synthetic resins and cellulose acetate, whether stressed or unstressed, gave no evidence of attack by ozone.

From this research it is evident that to specify the life of a rubber composition, the mechanical stress as well as the ozone concentration in the surrounding atmosphere must be known.

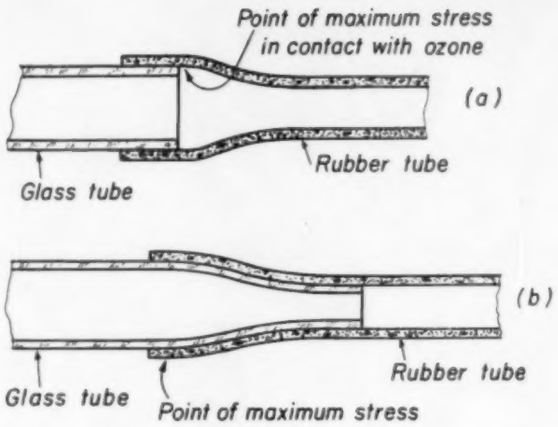


FIG. 9(a). Conventional type of glass to rubber tube connection which accelerates the disintegration of the rubber tube at its junction with the glass tube when used to conduct ozone. (b) Special type of connection designed to eliminate the objectionable structural feature present in ordinary design.

Nitrogen Content in Rubber

THE determination of nitrogen in rubber offers one of the best criterion of the purity of the rubber. As a general rule, the Kjeldahl method of determination is used, since it is generally agreed that the nitrogen in rubber is present as a protein. Recently, however, a series of tests were carried out to determine the amount of nitrogen present by the Dumas method. A discrepancy occurs between the two methods, that of Dumas indicating that there is far more nitrogen present in rubber (by almost 200%) than shown by the Kjeldahl method. This discrepancy was commented upon by Dr. Philip Schidrowitz in his column on "Views and Reviews" in recent issues of the *India-Rubber Journal.*

In an attempt to determine whether the Kjeldahl or the Dumas method was the more accurate in determining the nitrogen content of rubber, Dr. Schidrowitz communicated with Dr. Samuel S. Pickles, noted British technologist, who was in charge of rubber analysis at the Imperial Institute (London) from 1912 to 1938, and who conducted numerous experiments on this subject. Dr. Pickles' answer to Dr. Schidrowitz follows:

"Concerning the priority of the use of the Kjeldahl method as a standard procedure in the examination of raw rubbers, I can only say that although I was not responsible for its introduction, I used it consistently from 1905 onwards, and adopted the conventional and traditional procedure of multiplying the nitrogen figure by 6.25 to convert it into a value which was returned as the protein or albumenoid content of the rubber. I think everyone who has adopted this procedure (for want of a better) has realized its arbitrary character; everyone must have felt that from the standpoint of exact scientific analysis it was unjustifiable. All that was hoped was that it did possibly represent some sort of average value which might reasonably be assumed.

"The ratio of P = 6.25 N. was one which had been derived from the examination of certain typical and well-defined proteids, but, as far as I know, this proportionality has never been demonstrated or confirmed with any consistent regularity in the case of rubber proteids. On the contrary, several of the investigations which have been made have given results widely differing from this ratio. When we reflect on such aspects as the partition of the nitrogenous compounds between coagulum and serum occurring in different methods and with differing speeds of coagulation, of the action of proteolytic enzymes and bacteria during such processes as maturation, can it reasonably be expected that any constant or uniform nitrogen ratio exists or persists in the nitrogen compounds in the various samples which we may be called upon to examine?

"The uncertainty regarding the validity of the assumed ratio between nitrogen content and total proteid will still exist whether the nitrogen is determined by the Kjeldahl or the Dumas method, but it would be of value to know if the results obtained by the latter process are consistently higher than those yielded by the former. It is possible that the information provided by a comparison of the results might indicate a difference in the mode of combination of the nitrogen, *e.g.*, the Kjeldahl estimation may more accurately indicate the proportion of true proteids, whilst the combustion results may provide a measure of the proteid content plus nitrogen-containing compounds of a different character."

America's Only Crude Rubber Plantation

Close-up of a tapped tree at the Miami Gardens. Two methods of tapping are being tried, the half-spiral every other day and the full spiral every three or four days.

First Report of Progress Made at the Federal Plant Introduction Gardens, in Miami, Florida, Where 2,000 Hevea Trees Are Under Careful Cultivation

By HAROLD M. FARKAS

WHILE the United States has concerned itself over the possibility of war interrupting its rubber supplies from the Far East, horticulturists at the Federal Plant Introduction Garden at Miami, Florida, have been experimenting with "home-grown" rubber trees for just such an emergency. Proof that progress has been made was demonstrated recently by the Bureau of Standards in Washington, D. C., which produced rubber heels from the rubber from latex of *Hevea brasiliensis* trees growing in Florida. The experiment cost the Department of Agriculture seventeen years of research and thousands of dollars, but government chemists reported the quality of the latex compared favorably with plantation grades.

In this promising test-tube rubber plantation are growing more than 2,000 *Hevea* trees from Haiti, Puerto Rico, Mexico and the Far East. It is the only rubber project on a plantation scale ever attempted outside the tropics. Some of the trees are 35 feet high and 10 inches in diameter.

For a tree whose natural habitat is in the region of the Equator, the *Hevea's* endurance and adaptability to temperate climate has amazed scientists. Periodic measurements have shown that its early growth has been as rapid in Miami as in Haiti and Mexico. Its resistance to cold weather has been incredible, surviving temperatures as low as 28 degrees. Like many Northern trees it has been found to shed its leaves in Winter, reducing frost danger, and making it particularly well-suited to cultivation in Florida.

The entire rubber reserve has sprung from seeds, many of which were sown nearly two decades ago. After sprouting from seed-beds, the young trees were transplanted into deep depressions near the water table so the tap roots could find permanent moisture. The creamy white latex tapped recently was a welcome sight to the botanists who had cared for them so long.

Experts have found that trees grown from selected East Indian seeds in the Florida Garden have produced a higher yield of latex in general than miscellaneous *Hevea* from other tropical lands. Experiments in hand polination have been tried with marked success to determine its possibilities.

Two methods of tapping have been tried—the half-spiral every other day, and the full spiral every three or four days. The half-spiral has proved most desirable, enabling workers to retap over the old scars every seventh year. As in most rubber trees, a purer and slightly increased flow of latex in the Florida *Hevea* is found toward the lower trunk.

Technicians do the tapping. Two grooves are cut into the tree with a regulation tapping knife—an

Technicians tapping Hevea brasiliensis in the Nation's only crude rubber plantation, the U. S. Plant Introduction Garden, Miami.

oblique cut to start the flow of latex, and a vertical channel cut to guide it to the spout which empties into a glass receptacle held to the tree by a wire holder. In the well-equipped laboratory of the Garden, the chemist coagulates the latex with acetic acid. It is then rolled, washed and dried, and the samples sent to Washington for study. Research workers of the Bell Telephone Company visited the rubber plantation recently to investigate the characteristics of the fresh latex as it comes from the trees in comparison with preserved latex from the Far East.

Future plans of the Federal Plant Introduction Garden call for an acclimatization clinic where strains of disease-proof and cold-resistant rubber trees in Florida may be distributed to sections of Tropical America and the West Indies where commercial rubber production might be considered.

Some horticulturists believe that America's emergency and perhaps economical source of rubber will come from some of the 600 varieties of latex-bearing shrubs, vines and plants found in the United States—like the Guayule, the desert milkweed and the goldenrod. In South Florida alone, rubber experts have found one hundred species.

These rubber plant experiments, too, are conducted at the Miami Garden. The plants are ground up and extracted with acetone in extraction thimbles. The acetone is evaporated and the soluble residue (chlorophyll, fats and resins) is weighed after drying. Then the original sample from which the acetone soluble material has been extracted is extracted with benzol in a glass flask and the benzol evaporated in an oven. The benzol extract, or rubber, is then weighed to determine its quantity.

Growing rubber in Miami was not just a scientific whim. Events of vital importance induced it. In 1922, it will be recalled, the United States was on the verge of a rubber famine. England, controlling 80% of the world's crude rubber, invoked the Stevenson Act restricting its exportation. Holland, controlling another 18%, boosted the tariff so high the price was prohibitive. A 10-cent increase per pound saddled American consumers with an added $75,000,000 burden.

Close-up of leaves, pods and seeds of the Hevea brasiliensis now under cultivation in Miami. Selected seeds have resulted in trees giving an excellent yield of latex.

A pair of rubber heels produced from the rubber from latex of Hevea brasiliensis trees growing in the Miami Gardens, made experimentally by the Bureau of Standards.

Yet the country needed rubber desperately. It used 75% of the world's market. Of 28,000,000 motor vehicles running over the earth's highways, 22,000,000 were in the United States. Her need was twenty times as great as any other nation's. The late Harvey S. Firestone campaigned for American-produced rubber and urged President Warren G. Harding to further its progress. The President asked Congress for $500,000 for the United States Department of Commerce to investigate the sources of crude rubber with provision that $100,000 might be transferred to the Department of Agriculture to investigate the possibilities of growing rubber in areas of Tropical America or within the United States and to discover new methods for rubber extraction.

The appropriation was granted and ever since, annual budgets have been allocated to the Department of Agriculture for rubber research. Today, officials of the Division of Plant Exploration and Introduction have indicated they are pleased with the results of Miami's rubber experiments. Loren G. Polhamus, Associate Technologist in Washington, recently said, "Definite progress has been made in our investigations and the possibilities of commercial production and emergency crops have been studied. We feel this progress to date justifies the continuation of these studies as rapidly as may be possible."

Advances in Latex Technology

By ROYCE J. NOBLE

Consulting Technologist and Author of "Latex in Industry"

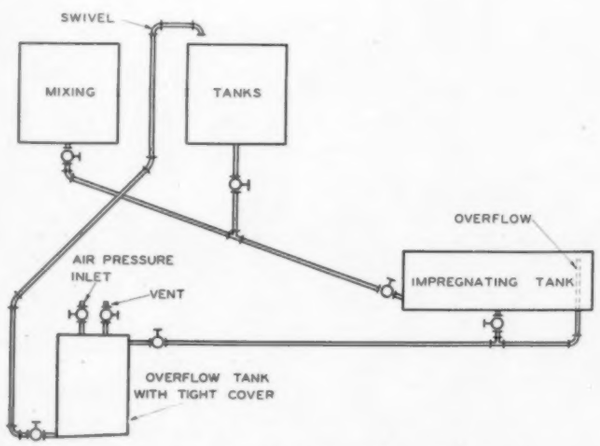
PART III

APPLICATIONS

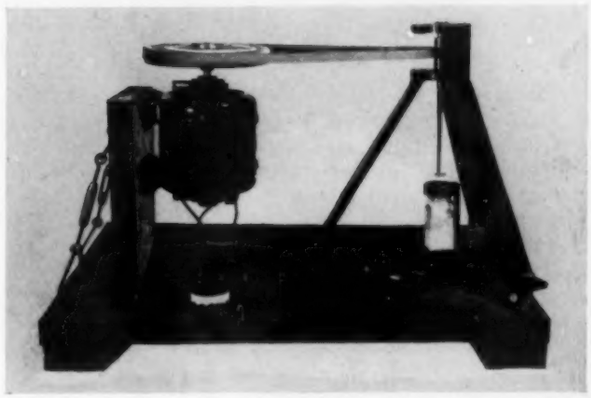
The advantages of latex over milled rubber and its solutions have been frequently referred to in the literature and need not be further discussed here. It is of interest to note, however, that in many of the newer and more important commercial developments, latex is being used to accomplish results and to make products not readily attainable, if at all, with the more conventional forms of rubber. Latex has become established in many applications, not only in the rubber industry itself, but in many other unrelated fields.

History

The early work of Peal, Thomas and Charles Hancock and others on the use of latex for saturation, in adhesives, and for bonding fibers and the like, is well known. In the rapid growth of the industry, examination of the records of other early uses has not been neglected. Crouch *(91)* has made some interesting comment on the unpublished manuscript of Las Casas, on which Antonio de Herrera's *Historia General de los Castellanos* (1601) was based. Several articles on the work of La Condamine appeared in a special number of *Revue Générale du Caoutchouc* in 1936. A brief biography of Fresneau *(92)* emphasizes the importance of his work done in the first half of the eighteenth century; he had prepared articles directly from latex as early as 1746. Eck *(93)* has written of other investigators of the latter half of the same century; attempts to import latex from the New World as early as 1770 are described—an undertaking made possible only after Fourcroy's recommendation of an alkaline preservative about twenty years later.



Design for latex impregnating and coating equipment, by R. T. Vanderbilt Co.



New type of constant speed mechanical stability test equipment developed by Firestone for use in checking the stability of latex.

Patents

While all of the important applications of latex have been covered by patents in most countries, none of them had been subjected to test in the courts prior to 1936. Since then several of the older patents involving coating and saturation of fibers and fabrics, manufacture of pile fabrics and vulcanization of latex, have been brought into litigation, and it is understood that suit has been initiated on certain patents for the manufacture of thread and sponge rubber from latex. In all cases dealt with so far, the decisions of the court have either invalidated or greatly limited the scope of the patents involved *(94)*.

Impregnation

The general problem of impregnating textile fibers and fabrics with latex, first dealt with in primitive fashion by South American natives, and later the sub-

ject of patents by Hancock, has not yet been satisfactorily solved. While the problem might not appear to be a difficult one, the work of numerous investigators indicates not only the impossibility of introducing the dispersed rubber hydrocarbon into the inner structure of the fiber, but that numerous other factors, such as water-repellent substances on the fibers, electrostatic charges and twist in yarns or thread, may prevent even partial impregnation.

The benefits sought from impregnation of textiles, particularly yarns and cords, are greater strength and elasticity. These qualities should be accompanied by a minimum of surface tackiness and rubbery feel. The rubber should be deposited for the most part within the textile material rather than on its external surface. Some of the means that have been employed to obtain this end will be briefly reviewed.

In an early patent Hopkinson stated that thread could be saturated with latex by mere immersion. That this is not the case was shown by the microscopic investigations of Hauser and Hunemorder some years ago. However, Bongrand *(95)* in the development of the "Filastic" process found that it was possible to impregnate thread in the sense of coating each individual fiber. To attain even this degree of impregnation it is necessary to observe certain precautions.

Since the pH value of the fiber is of the order of 3.5 to 4.0 and that of ammonia-preserved latex 10.5 to 11.5, coagulation of the latex particles takes place on contact with the fiber surface. It is necessary, therefore, to bring the two materials to the same pH value; with Hevea latex it is found most practical to increase the pH value of the fibers. In the case of acid latices, such as *Funtumia,* no coagulation takes place and the fibers may be immersed directly in the latex.

Numerous other factors affect the degree of impregnation. Any wetting agent employed must be effective at the pH conditions of the system. Application of vacuum to the fiber to remove air, and subsequent introduction of the latex under pressure, assist in thorough impregnation. After treatment of the latex it is also found desirable to rotate the spools on which the thread is wound in order to prevent draining of the latex. Finally the latex rubber is fixed on the fibers by coagulation, by unwinding the thread from the spool through a coagulant. By following the above noted steps of impregnation, Bongrand was able to impregnate thread with up to 50% of rubber. The product so obtained has been found particularly useful in the manufacture of filter cloths, belting, conveyor belts and the like, and is said to have excellent resistance to wear, a high coefficient of friction, and to be highly flexible and resistant to acid and alkalies.

Hand-operated single latex dip machine with circulating tank made by Miami Boiler & Machine.

Stevens' work *(96)* has further established the fact that latex does not penetrate fibers, but may pass between the individual fibers of a thread if the amount of twisting is not excessive. He has also investigated the treatment of knit goods, such as hosiery, to prevent running, a very small amount of latex being employed so that it is not apparent in the finished article. He finds that the surface tack of vulcanized latex-saturated or coated fabrics may be overcome if the ratio of latex rubber to starch or other finishing materials is kept low.

If it is attempted to use pure latex compounds or finishes that are largely latex, the characteristic feel of latex rubber is encountered and this is particularly objectionable in the textile trade. In the same way latex and emulsified waxes may be used for waterproof finishes if the ratio of latex rubber to wax is not greater than about 1 to 1. The wax serves to overcome the tacky feel of the rubber and the latex serves to firmly hold the wax on the fabric through cleaning operations.

Another method of removing tack is to treat the rubberized material with bromine or chlorine water containing about 3½ grams of the halogenating material per liter, the treatment lasting for about 2 minutes as a minimum. An alternative method is to give the material a thorough soaking in warm and slightly soapy water. This latter treatment extracts much of the non-rubber material, but it is too long an operation for usual factory practice.

More recently Blow *(97)* attacked the problem of impregnation by a somewhat different method. Like Bongrand, he recognizes the part played by the positively charged fibers in causing coagulation of the negatively charged latex particles, and takes advantage of this effect to secure thorough bonding of the rubber to the fibers. To accomplish this he employs the cationic soaps which are adsorbed by both rubber and textiles and thus serve as a mutual bond.

These soaps differ from the usual anionic soaps in that the hydrophilic group in the molecule is a positive quaternary ammonium radical, with an attached fatty acid chain, while the negative ion is a halide, sulfate or similar group. Typical of such soaps is cetyl pyridinium bromide (Fixanol). When added to latex in small quantities they cause flocculation, but in slight excess they produce stable, positively-charged latices.

Soaps of this type are strongly adsorbed on the fibers, imparting to them a positive charge. Adsorption on the fibers takes place best at a pH above 8 and at slightly elevated temperatures over a period of several hours. Most fibers adsorb up to about 1% of the soap. When fibers so treated are immersed in a dilute (5%) latex bath, the rubber particles are

deposited directly on the fibers and complete exhaustion of the bath takes place—if sufficient time is allowed.

Alternatively, cationic soaps can be added to the latex to cause reversal of charge on the latex particles. With most of these soaps a minimum of about 3% on the rubber content is required to effect reversal of charge, the reversal being independent of the actual pH of the latex. The stable, positively-charged latex so obtained will deposit directly on fibers in an alkaline medium.

Another important development in textile finishing is the production of crease-resisting fabrics. The operation is simple, but its success depends upon the choice of a suitable latex compound *(98)*. The compound should contain very little loading of any kind and should be capable of thoroughly penetrating the fabric and subsequently drying and vulcanizing under the usual finishing conditions.

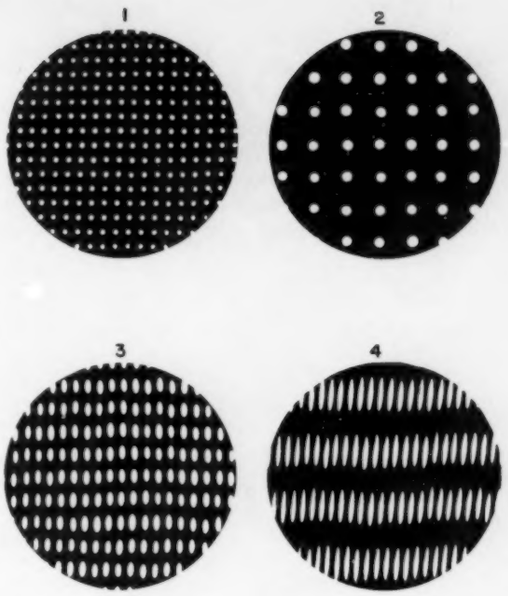
Latex compositions have been used for the treatment of cut fabrics to prevent fraying of the edges. It has been found advantageous to so treat the edges of fibers before attaching closure means, such as zippers *(99)*.

A special use of latex has been found in the delustering of fabrics, such as artificial silks. The application of a small amount of latex, which may be incorporated with other finishing materials in some one of the usual steps, results not only in a decrease of luster, which is desirable, but the latex may also assist in bonding the finishing materials to the fabric.

The manufacture of balloon fabric continues to be the subject of some study. At the United States Bureau of Standards the effect of moisture on fabrics coated with latex in combination with other materials has been examined *(100)*. For special purposes it is also desirable to fireproof latex-saturated or coated materials, as with chlorinated naphthalene waxes.

A recent development in tire manufacture is the manufacture of heat-resistant cord. Besides being unaffected by heat, tire cord should permit minimum growth in the tire and should have a minimum cross-section; the fibers should be well bonded together and elongation should not vary with temperature. A type of cord meeting these requirements in large measure has been developed and placed on the market *(101)*. In the development of rayon tire fabrics, latex has also been found useful as a bond between the rayon cord and a top rubber coating *(102)*. The silk, in the form of thread, yarn or cord, is treated with a casein-latex composition, dried, rubberized and vulcanized. A similar procedure may be used in making V or flat belts.

Although the treatment of glass wool with latex is not strictly an impregnation process, it has, nevertheless, become a matter of considerable interest since the introduction of this type of fiber for thermal insulation, battery separators and numerous other industrial applications *(103)*. Because of the nature of the fiber, several precautions must be observed in subjecting it to any treatment or adapting it to certain specific uses. Glass fibers are not strongly resistant to compression, abrasion or bending, and when wet, undergo considerable decrease in mechanical resistance. The fibers do not contract or stretch and hence fabrics or bats comprising them must be cut to the dimension and exact shape in which they are to be used.



(1) Multipore containing 6400 pores per sq. in., pore diameter .004-inch. (2) Multipore containing 1100 pores per sq. in., pore diameter .010-inch. (3) Expanded Multipore made from 3200 pore per sq. in. base stock, expanded 50% in one direction, pore dimensions .005 x .012-inch. (4) Expanded hard rubber Multipore made from base stock containing 3200 pores per sq. in., expanded 250% in one direction, pore dimensions .005 x .035-inch. Magnification: 5.40 X.

In view of these properties, it is frequently desirable to impregnate glass fabrics, such as those used for filter cloths, in order to reinforce them and to prevent crushing under compression or bending. Impregnation also tends to prevent the fabric from wearing and from local deterioration at points of contact with other materials. In many cases it may not be necessary to impregnate the entire fabric, but only at the point where it must be protected.

In the impregnation of glass fibers the latex compound is diluted to a consistency at which it readily penetrates the fabric or penetrates to the desired extent below one surface. In the latter case it may be necessary to control the impregnation by applying a relatively thick latex by means of a roller, thus forcing it partially through the fabric. Alternatively, latex may be applied by spraying. If both maximum impregnation and a high degree of surface protection is desired, the glass fabric may first be saturated with a thin solution of latex, and subsequent coatings applied to the surface only.

Spreading, Coating

Discussion arises occasionally as to the choice between latex and milled rubber for proofing purposes, the latter being applied either as a dough or by calendering *(104)*. Some of the factors involved are quality, demand, cost and conditions of operation. As

to cost, latex spreading is undoubtedly the most economical method for application of thin or thick coatings as conditions may require. Latex gives a surface or handle, however, which in some goods will be found undesirable.

Spreading by means of a doctor blade can be greatly accelerated, and the difficulties resulting from the formation of small pieces of coagulum greatly reduced, if a potential difference is maintained between the latex compound and the spreader bar *(105)*. Under these conditions there is a tendency for water to separate at the surface next to the blade and act as a lubricant.

Numerous methods have been devised for producing decorative effects on spread or coated articles. To the spreading composition, for example, may be added grains of decorative materials and the whole used for coating. Alternatively *(106)*, decorative granules or chippings may be pressed in the spread surface, this latter procedure being particularly advantageous when cement-latex compositions are used.

Special means of improving the feel and appearance of latex spread surfaces have been developed. In one process a condensation product of lecithin and a fatty acid is incorporated in the latex, resulting in decreased tackiness in the dried surface *(107)*. Another method consists in the treatment of the dried latex surface with a solution of sulfur chloride, and subsequently with water. A leathery feel is thus imparted to the fabric or other coated surface.

It has been found that the amount of loading obtainable in a latex compound for spreading purposes is subject to wide variations, depending on the protective colloid used. As an example, whereas 10% of casein on the latex rubber will permit loadings only up to about 350 or 400% of lithopone, gum tragacanth will make possible loadings up to 900% or over. Similarly, with china clay a loading of 225% with casein may be increased to over 500% with gum tragacanth *(108)*.

Much work remains to be done on improvement of the aging characteristics of coated fabrics. In general, the aging of such materials is not as good as that of the equivalent amount of rubber spread as a film of the same size. This is probably due to the fact that the rubber is exposed to a much larger surface when disposed in and on the fabric.

Inflating a stratosphere balloon made by Dewey & Almy by the Kaysam Process. These balloons are cast in small molds and are partially inflated before they are dried and vulcanized.

Sheet Materials

In a number of instances waste materials, such as cork or leather trimmings, have been used to form sheet materials which may be used either as a substitute for the original or for building materials and the like. Cork waste can be made into thick sheets which may be used as such or cut into stoppers or other articles. For this purpose latex has the advantage that it forms an elastic and water-resistant bond so that the final product has many of the characteristics of the natural material.

Perforated Sheet

It was Charles Goodyear who first suggested that perforated sheet rubber might be widely substituted for wire cloth for sieving purposes. In recent years, with increasing need for such products, there has been much interest in developing new methods for making them from latex *(109)*.

One product of this type is now produced commercially under the name of Multipore *(110)* and is available in either soft or hard rubber, or neoprene. Several advantages over the mechanically perforated sheet are claimed, among which may be mentioned smaller holes, more holes per unit of area, and greater mechanical strength.

The perforated sheet is made by applying a latex coating to a fabric belt or blanket containing very small air pockets. When the belt is heated, the air expands, forming bubbles which burst, leaving small holes in the latex film. If the rubber film is stretched during the vulcanization, the holes become elongated and are fixed in this shape.

Textile Printing

Latex is now being successfully used in textile printing. It can be incorporated in printing pastes, but care must be taken that the latex compound is properly prepared. The correct choice of compounding materials with a view to their possible effect during printing and finishing is important. It is also necessary that the latex be sufficiently stable to withstand the mechanical treatment to which the paste is submitted.

The binders commonly used in printing are various gums and albumin. They are objectionable in that, upon drying, they crack and dust out of the fabric, together with the pigment; they may also be eliminated in part during finishing operations. Latex, when properly compounded, is an excellent vehicle for all pigments used for printing, and withstands the finishing operations, the fabric remaining soft and flexible.

Equipment

Nearly all processes involving impregnation or coating of fibrous materials or fabrics involve the steps of drying and vulcanizing. In the past few years many improvements have been made in drying apparatus and for some operations special equipment has been designed to meet the requirements of latex saturators and coaters.

One company has built a machine particularly adapt-

ed to the drying of latex-coated fabrics. With light weight fabrics, speeds up to 40 yards per minute may be obtained. The latex is applied by means of a standard spreading knife and the fabric carried through the machine on pin chains which hold it at full width. In the first unit of the drying machine, steam is blown over the spread surface, this treatment aiding in the prevention of rapid formation of a rubber film which tends to retard drying. A high efficiency in the drying chamber is maintained by use of several air streams at controlled velocities. In the vulcanizing chamber provision is made for using air under slight pressure as a means of aiding vulcanization. Alternatively, an inert gas may be used in place of air to avoid surface oxidation *(111)*.

Festoon dryers and vulcanizers of improved design are also available. The same principles of controlled drying as above mentioned are used, but the air streams are maintained at lower velocities. This type of dryer is also available for vulcanizing articles of irregular or unusual shapes. The articles are placed on trays and air at high velocity is blown over the whole surface to effect rapid drying.

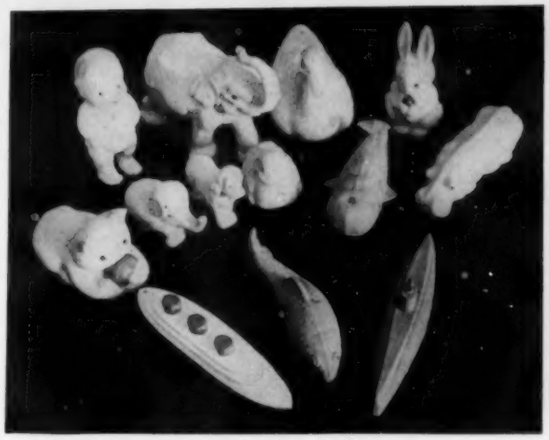
Special machines have been built for the impregnation of yarns and cords *(112)*. One of these is similar to a warp sizer. Means are provided for flexing the cord during saturation. Operation may be as rapid as 150 yards per minute and up to 400 ends treated at the same time. The use of equipment for saturating fibrous materials under alternate vacuum and pressure has already been referred to.

Dipping

As in the past, the manufacture of dipped goods continues to be one of the most important fields of latex application. The many advantages resulting from the use of latex in place of rubber solutions have been largely responsible for this development. Many of the early difficulties *(113)* experienced with dipped goods have been overcome and most manufacturers have learned to operate under well regulated conditions. Details of current dipping practice in England have been given by Stern *(114)*.

Some of the surgeons' gloves first made from latex were found to be objectionable because of their high tensile strength and low elongation, and the consequent strain on the hand over long periods of use. Through improved compounding and treatment these difficulties have been largely surmounted although it is understood that latex gloves are not yet generally used in European countries. Household gloves are being manufactured in considerable quantities, although the market is highly competitive. Gloves with parts of different thicknesses are made by neutralizing the coagulant in certain areas *(115)*.

Much attention has been given to the surface finish on all types of latex dipped articles in an effort to simulate the dry smooth surface generally obtained with articles made from milled rubber or rubber solutions. Various means have been employed to accomplish this end, among which may be mentioned the use of lacquers, waxes and shellac, and bromination or chlorination. More recently sulfur chloride has been used by some manufacturers *(116)*, but this is to be considered objectionable. While the appearance and feel of the article is improved, the aging properties are adversely affected.



A group of new latex toys made by the Kaysam Process by the Kaysam Corp. They float, squeak and are also unbreakable.

In those cases where transparency of the article is sought, latex has not been able to compete with any degree of success until recently. With the proper choice of accelerator and latex, it is now possible to obtain dipped articles, such as nipples, closely approaching those manufactured from rubber in solvent.

In the manufacture of very thin articles, latex compounds are used almost exclusively at the present time. The principal difficulties in the manufacture of articles of this type lie in the danger of formation of pin holes, due either to minute air bubbles in the latex compound or to small particles of dirt or improperly dispersed compounding materials. Through elimination of faulty merchandise by careful testing, and because of the low price and excellent aging properties, latex dipped articles will continue to lead in this field.

There has been much improvement in dipping equipment *(117)* in the last few years, both for automatic and semi-automatic dipping. Small dipping tanks are now available for laboratory and small scale work capable of duplicating results obtained in factory size equipment.

Molding

One of the more important developments of the Kaysam molding process *(118)* has been the manufacture of stratosphere balloons. These balloons are cast in relatively small molds and are partially inflated before being dried and vulcanized. When inflated with hydrogen and released, the balloons expand to a diameter of 15 to 20 feet before breaking at heights of 10 to 12 miles.

The principal use of the stratosphere balloon is for weather forecasting. For this purpose a meteorograph capable of measuring temperature, humidity and pressure, and of transmitting these readings by radio to a ground station, is attached to the balloon. In this way conditions at different air levels may be recorded. The balloons are initially inflated to a diameter of 3 to 4 feet with a small amount of hydrogen and the meteorograph is then attached. Care must be taken in releasing the assembled equipment; when necessary, because of high wind, this may be done by means of a special launching tunnel.

Photo, Courtesy "Product Engineering"

Two halves of a plaster supporting shell and a split rubber mold are seen above. Molds of this type are finding wide use for the casting of metals and plastics.

Stratosphere balloons have found many uses other than routine measurement of atmospheric conditions. They have been used in studies of the causes of hurricanes and in gathering information on atmospheric conditions at high altitudes attendant upon such storms. Carrying special instruments, they have been used in gathering cosmic ray data. Polar expeditions have found them useful in determining weather conditions at high altitudes. With flares attached, they have been used for studying air currents at night.

Another development in molding operations is the manufacture of masks for theatrical or decorative purposes, as well as figures for advertising display purposes *(119)*. These are made in either life or miniature sizes. The masks are made by first forming a moulage cast, molded to the facial contours; from this a plaster of Paris mold is made, and from the plaster mold a negative is obtained in modelling clay. A piece mold in plaster, again in the negative, is formed, and from this a wax impression is made. Into a final one-piece mold of plaster of Paris, made from the wax impression, is poured the specially prepared latex compound and this is allowed to remain for a time, depending upon the thickness required in the final product. The latex deposit is dried and vulcanized and the masks are colored in natural tints by hand. Figures such as animals or other objects are made in a similar way.

Molds for Casting Plaster

One of the recent uses for rubber molds is that of casting plaster or plastics *(120)*. Rubber molds were first used in the manufacture of novelty jewelry, the plastic material being used either hot or cold. The technique has now been improved to such a point that statues of considerable size can be cast in this manner. Rubber molds possess special advantages, most important of which are their durability and ease in handling. Preparation of the molds, especially in the case of smaller objects, is very simple, provided the proper type of latex compound is used. After the mold has once been made, a large number of objects may be cast from it, provided a suitable degree of care is used and that it is not subjected to temperatures much over 200° F.

The latex compound usually has a high solids content and such a consistency that it may be sprayed or brushed on the form, or preferably that the form or model may be dipped in it. If the size of the object is such that it may be dipped in the latex, less difficulty is experienced with air bubbles than is the case when spraying or brushing. After the model has been coated it is dried in warm air and the dipping repeated until sufficient wall thickness has been built up. The mold is then thoroughly dried and vulcanized. It will generally be necessary to form a plaster backing or other rigid support for the mold. Since the rubber is flexible the material cast in it will tend to cause some deformation unless such backing is used.

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(The final installment in this series of articles on latex technology will appear next month.)

A skirt fringed with rubber bands, necklace and girdle of rubber tubing, and a small tire as a crown, was part of the model's costume.

Rubber at the Patent Law Sesquicentennial

RUBBER and Charles Goodyear were much in evidence and well represented at the 150th anniversary of the signing of the first United States patent law by President George Washington in 1790, which was celebrated in Washington, D. C., the week of April 8th.

A committee of 75 present-day scientists and industrialists selected America's 19 greatest inventions, and Charles Goodyear's patent of vulcanization of rubber was fifth in the list, being preceded by Eli Whitney (cotton gin), Robert Fulton (commercial steamboat), Cyrus H. McCormick (reaper), and Samuel F. B. Morse (telegraph). Others in the list were Elias Howe, Jr., C. L. Sholes, George Westinghouse, Alexander Graham Bell, Thomas A. Edison (three inventions), Nikola Tesla, Charles M. Hall, Ottmar Mergenthaler, Orville and Wilbur Wright, Lee De Forest, Leo H. Baekeland, and William M. Burton.

High point of the celebration was a dinner at the Mayflower Hotel, on April 10th, attended by more than 1,200 inventors, scientists, and industrialists, at which Dr. Charles F. Kettering, President, General Motors Research Corporation, was Chairman. A feature of the dinner entertainment was a style show of mannequins attired in costumes symbolic of leading American industries. Costume of the mannequin representing the rubber industry was made entirely of rubber with skirt fashioned from 9,000 rubber bands, topped off by a small rubber tire as crown. The nine other industries, led by Miss Patents, with gown made of facsimiles of famous United States patents, were printing, photography, communications, metals, aviation, business machines, foodstuffs, automobiles, and chemicals.

The dinner was sufficient to satisfy the appetite and imagination of even an inventor, beginning with patented snakebite antidote cocktail and running through such items as carborundum canape, patented breast of turkey, telephone peas, vacuum tubers, incandescent salad, phonograph cake, airplane ice cream, reaper rolls, and aluminum nuts—all edible.

A coast-to-coast radio hookup carried the speeches of Dr. Kettering, Patent Commissioner Conway P. Coe, and Under Secretary of Commerce Edward J. Noble. Dr. Kettering listed the following ten lines of "unfinished business" for future efforts of inventors: adequate housing, modern highways, preventative cures, communications, air conditioning, fundamental scientific information, knowledge of plant growth, improvement in transportation systems, more efficient cities, and better knowledge of the properties of materials. He especially stressed the point that, "It is a fallacy to believe that we have reached the end of the road of progress."

The Koroseal section of the Goodrich exhibit at the Patent Sesquicentennial.

This chart, which traces the major steps in the production of buna, was exhibited by Firestone.

A Parade of Inventions—sponsored by the Patent Law Sesquicentennial Committee in cooperation with the U. S. Patent Office—was opened to the public in the lobby and auditorium of the Commerce Building on April 10th. Arriving at the Commerce Building, the first object seen was an immense airplane tire on the pavement at the main entrance, a Firestone 90 x 36 for the Army "flying fortress" bombers.

Rubber also was very much in sight in the exhibits in the auditorium which formed a good cross-section of the works of American inventive genius, although among the many models in the lobby of the building there was nothing suggestive of rubber, except the model of the footwear sewing machine patented by Charles Goodyear, Jr. This lack of rubber in the early models is quite understandable because such patents were confined largely to improvements in processes of manufacture. Among the models was the first Colt revolver and the impracticable patent of Abraham Lincoln for lifting boats over shallow waters, which is often described as being equivalent to lifting oneself by the bootstraps.

Largest and most prominent rubber exhibit was that of the Firestone Tire & Rubber Company, with announcer and loud speaker, pretty girl models, and demonstrators. This exhibit depicted the various phases of the development of the rubber industry since the introduction of the first all-rubber, non-skid tire in 1908. Highlight of the exhibit was an all-synthetic airplane tire made of rayon and Dupont's neoprene. Other interesting tires on exhibit included a 96-inch airplane tire, weighing 940 pounds and capable of supporting a load of 80,000 pounds. Largest individual tire exhibit was a section showing Firestone's 30.00 x 40 Earth Mover Tire, which stands 104 inches high and weighs 2,390 pounds.

In addition to tires the Firestone exhibit also featured the development of Airtex mattresses and cushions, Controlastic yarns, and the seadrome contact light buoy which was recently introduced to mark runways for seaplane take-offs and landings. The comfortableness of the Airtex mattresses was demonstrated by one of the girl models in night attire. Another of the models displayed a bathing suit of Controlastic thread. The section devoted to Controlastic contained window curtains and drapes, bathing shoes, slippers, stockings, corsets, handbags, and spools of different colored rubber thread.

As a demonstration of Airtex manufacturing methods, ordinary latex was whipped into aerated form by an ordinary kitchen mixer and then cured in a pressure cooker. The small Airtex biscuits thus produced were given away as souvenirs to exhibit visitors, with the admonition that they were not to be eaten.

The Goodyear Tire & Rubber Company exhibit was formed around the large oil painting of Charles Goodyear discovering vulcanization of rubber which the company has used in calendars and in national advertisements. Photostats of the application for the vul-

The Goodyear exhibit was divided into three sections, as seen. It portrayed rubber from the gathering process to its use in the manufacture of myriads of products.

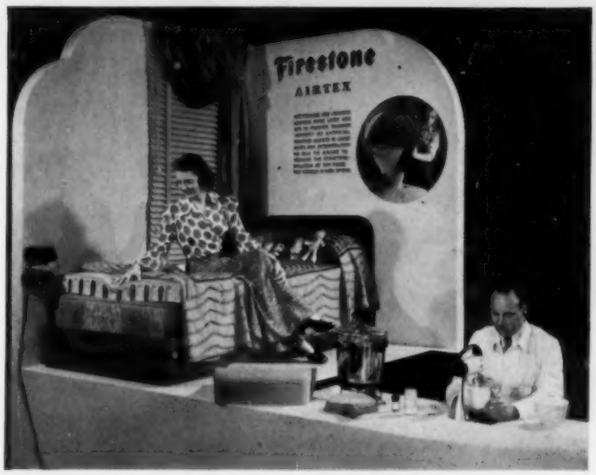
canization patent, together with one of the patent itself, were displayed in a glass case beneath the painting. One end of the exhibit was held upright by the trunk and first branches of a rubber tree which was undergoing tapping operations. A large bottle of liquid rubber latex was under the tree. Goodyear Airfoam mattresses were shown by a small sample.

Illustrated posters were devoted to the use of rubber in the home, with samples of rubber flooring and wall rubber. Other posters and pictures depicted the uses of rubber on the farm, such as tires for implements, and of the giant tires on the South Polar "Snow Cruiser." Articles of Pliofilm also were on display, as were a modern passenger car tire and the smallest pneumatic tire in the world (size 5 x 1.75 inches).

Exhibit of the B. F. Goodrich Company consisted of a background of posters giving the history of the automobile tire in chronological order and its development from 1896. The Goodrich road expansion joint filler was demonstrated by a moving display showing the expansion and contraction of a cross-section of concrete paving. Another demonstration contrasted the vibration on a table top of an unmounted electric motor with one mounted on rubber. Koroseal formed a large part of the Goodrich exhibit with a demonstration of the waterproof qualities of fabric treated with Koroseal against untreated fabric, water trickling through the untreated fabric and being retained by that covered with Koroseal. A glass laboratory distillation apparatus hookup over a gas flame gave life to the exhibit and attracted attention to many samples of Koroseal—make-up capes, jackets, coats, bibs, extruded wire and tubing, and bowl covers.

Under the caption, "Anode Latex Aids in Surgery," Goodrich showed many rubber surgical rubber items, such as catheters and drains, anæsthesia administration apparatus, ice caps, hot water bags, gloves, funnels, and tubing. The attendant told of the merits of an ice bag made to fit the face with holes for sight and another fashioned to cover the head, "Good for the morning after," he said. Some of these products were colored and others were the color of amber crepe paper.

Three additional types of so-called synthetic rubbers appeared in the Chemical Section, the displays being small and confined to posters and to the tops of tables



In Firestone's Airtex exhibit latex was whipped in an ordinary kitchen mixer and then cured in a small pressure cooker.

on which were samples of the various articles made from these substances. Du Pont exhibited neoprene gloves, coated fabric gloves, kitchen plate scrapers, drainboard mats, automobile windshield wipers, tubing, gaskets, shoe soles, and belting. The origin of "Thiokol" was indicated by jars of sodium polysulfide, dichlorethyl, "Thiokol" latex, and "Thiokol" coagulum, with a mass of "Thiokol." Some of its mechanical uses, as in belting, fabric coatings, ignition wire, gaskets, hose, and sheeting of cork-polysulfide composition, were illustrated. Vistanex (polybutene) was shown by a chemical diagram and equations with technical names, and a few samples of its uses, such as cable insulation, packing, adhesives, tapes, and acid-resisting lining. Descriptive literature appeared for neoprene.

It is to be regretted that all the branches of the rubber industry were not represented by the exhibits, but it is thought those present did a good job of which they should be proud. The interest of the public in the exhibits was shown by a daily attendance of more than three thousand.

Para Lube

PARA LUBE is an asphaltic flux product used as a softening and dispersing agent, an activator, and a lubricating agent. It is manufactured by C. P. Hall Company, Akron, Ohio. As a softener, Para Lube is recommended by its manufacturer in the production of molded goods, extruded goods and in hard rubber products. Its activating properties are such that in many instances the usual amount of fatty acid in the compound may be omitted or greatly reduced. Its use as a lubricating agent is said to result in cleaner molding of the stocks so that molds do not have to be cleaned so frequently. Cleaner molding results in a product which frees more easily from the mold and which is improved in appearance. Para Lube, according to its manufacturer, flows readily at ordinary factory temperatures and can be pumped anywhere in the plant.

Synthetic 190

DESCRIBED as being superior to rubber in its resistance to oxidation, aging and to metals ordinarily injurious to rubber, Synthetic 190, a highly polymerized saturated hydrocarbon, has been introduced by Moore & Munger, 212 Park Ave., Plainfield, N. J. The new material, according to its supplier, has no taste or odor, good electrical properties, high resistance to cold, simple processing properties, and is compatible with rubber. It is said to be especially suitable for white goods where sunchecking and discoloration are problems, as in white side-wall tires and footwear. Further claims made for the new material are that it will reduce permeability to air and gases and provide good aging in inner tubes; that it has very low water absorption, good dielectric and super aging properties, such as required in insulated wire; and that it will impart good heat resistance to compounds.

Report of the Crude Rubber Committee

The accompanying report of the Crude Rubber Committee of the Division of Rubber Chemistry, A.C.S., is the final revised copy which has been adopted by that Committee after the report read at the Spring Meeting of the Division in Cincinnati, April 11-12, was submitted to all members of the Committee for revisions. This revised report, now officially released for publication, incorporates much additional material not included in the original report as read by George Sackett, of Goodyear, Chairman of the Committee, at Cincinnati.—Editor.

THIS meeting of the Division of Rubber Chemistry marks the fifth anniversary of the establishment of the Crude Rubber Committee. The Committee wishes to express its thanks to the Chairmen of the Division of Rubber Chemistry and to those members of the Division who have cooperated with it in any way. The Committee also wishes publicly to acknowledge and express its appreciation of the very excellent leadership given the Committee by its past Chairmen.

The Crude Rubber Committee this year has an enlarged membership, there being seven regular members, whereas formerly there were five, and each regular member has an alternate who is familiar with the work and problems under investigation by the Committee. This increase in membership was effected in order to cover more completely all fields of rubber technology, and to insure that each member could be represented by a fully qualified alternate at any of the meetings of the Committee.

Since this is the fifth anniversary of the Committee, it may be in order to review very briefly the work of the Committee before proceeding to a consideration of the problems now under investigation.

The Committee is very much pleased that the standard recipe for testing the rate of cure of crude rubber has been so well received and so widely adopted, particularly by technical organizations closely connected with crude rubber production.

Standard methods of analysis of crude rubber for copper and manganese have been published by the Committee. Both these materials have long been considered deleterious to rubber and yet up to now there has been no generally accepted method for determining the extent of their presence in crude rubber.

Procedures for the testing of latex have been published in the *Analytical Edition* of *Industrial and Engineering Chemistry*, and in *Rubber Chemistry and Technology*. The procedures do not cover all types of latex testing, and additions to these will be made from time to time.

The subject of testing the plasticity of crude rubber has been under consideration for a long time and much work has been done. As yet the Committee has not reached an agreement regarding any procedure for testing this property which would allow it to be proposed as a standard method.

The Committee has also given considerable attention to the development of a recipe and test to determine the age resistance of crude rubber and to the problem of determining the amount of dirt or foreign matter in crude rubber.

Exchange of opinions and correspondence with rubber technologists, representing producers of crude rubber as well as manufacturers, has also been a matter of major importance. To accomplish results of lasting value, we in this country must keep in mind the needs of other users, and we must also have regard for the problems of the producer. It is in this field that the Crude Rubber Committee can justify its existence as much as in any other.

The present activities are a continuation of the past. The Committee meets at irregular intervals to discuss the progress of study of problems under consideration and to decide on future work.

The Committee met in Akron on January 22, 1940. This was the first meeting of the enlarged committee and was attended by all the members and several of the alternates. The following items were under consideration and the report on them is given below.

(1) Plasticity: A number of the details of a test procedure were agreed upon but the Committee felt that several points should be investigated further before publishing a tentative procedure. Publication of this procedure may be expected in the near future.

(2) Latex Testing: A test for mechanical stability of latex was discussed. This test is being studied in several laboratories, and it was decided to await the results of these studies before offering a procedure to the Division. The Committee has placed this important subject on the agenda for its next meeting, and hopes to make a report on it at the next meeting of the Division.

Tentative procedures for testing latex have been published and the Committee purchased a number of reprints and distributed them to various technologists, both in this country and abroad. Any member of the Division who requires a copy of these procedures, which may be found in *Rubber Chemistry and Technology*, Vol. 13, No. 1 (Jan., 1940), or in *Industrial and Engineering Chemistry, Analytical Edition*, Vol. 11, pp. 593-597 (1939), should write to the Chairman of the Crude Rubber Committee.

The Committee has found that there were three errors in these tentative procedures as published. Referring to page 595 in *Industrial and Engineering Chemistry*, or page 142 in *Rubber Chemistry and Tech-*

nology, equation (3-b) under the subheading "Determining pH—L6," should read

$$E_0 = E_1 - \frac{pH_1 \ (E_1 - E_2)}{pH_1 - pH_2}$$

Referring to page 597 in *Industrial and Engineering Chemistry*, or page 146 in *Rubber Chemistry and Technology*, under the subheading "Determining Viscosity and Yield Point, L-7," equation (1) should read

$$K_1 = \frac{\pi \ R^4 gd \ (h_1 - h_2) \times 100}{8 \ LV}$$

Referring to page 597 in *Industrial and Engineering Chemistry*, or page 147 in *Rubber Chemistry and Technology*, under the subheading "Determining Water Solubles, L-11", the following corrections should be made in the first paragraph under "Details":

The third sentence should read, "Transfer to a 200 cc. volumetric phosphoric acid flask (this type of flask has a wide neck and is easily cleaned), and make up to within about 20 cc. of the mark."

The next sentence calls for 1 N sulfuric acid. This should be 0.1 N sulfuric acid.

(3) Packaging: Carefully made crude rubber cannot reach the consumer without contamination by foreign material unless it is enclosed in a suitable package which prevents the entrance of dirt. A tightly pressed bale, wrapped in treated hessian fabric, has been generally agreed as a more satisfactory package from this standpoint than the venesta cases used, but these bales have some serious disadvantages.

A method of packing smoked sheets in a rubber wrapper appears to be a distinct improvement and the Committee would like to have all members read the description of this type of package as given by Mr. D. E. Andrews in a recent issue of the *India Rubber World*. The package there described has considerable merit, and deserves serious consideration.

The present shortage of wooden cases may force the more general use of the bale as a standard package and it would be advantageous to the crude rubber consumer to have the better grades packed in a container which would more satisfactorily keep the rubber as clean as it was when it left the plantation.

(4) Sampling: All tests of rubber properties such as rate of cure, plasticity, age resistance, and presence of deleterious materials require the use of single small samples. Crude rubber is not adapted to easy drawing of samples, and so great care must be exercised in order to get a truly representative quantity on which to base judgment of the whole lot under examination. No standard procedure for sampling rubber for analysis of its technical properties has been proposed. The Committee now has this subject under their careful consideration, and will welcome suggestions or ideas from any members of the Division of Rubber Chemistry who may have done work along these lines.

(5) Age Resistance: The Committee reported at the Spring meeting in 1937 that the initial investigation of the subject of age resistance had resulted in a mass of conflicting data. The subject has been reopened and is now receiving further attention from the Committee.

The Committee is trying first to find whether a practical compound, tested by an accepted standard age resistance test, will show that crude rubber, free from deleterious substances, will show variations in its resistance to the test. The test will also have to reflect the presence of deleterious substances. At present, the Committee has no definite information as to whether rubber varies in this way and will welcome any information along this line from anyone who has had experience with such rubber.

(6) Rate of Cure: Since publication of the standard recipe, we have had a number of inquiries from various places as to what would be considered a good rate of cure for rubber.

The Committee was established to bring together the ideas of the rubber technologists in the United States regarding crude rubber, and to convey those ideas to technologists working on crude rubber in other countries. All mention of standards of quality and allowable limits of variation of any property have been deliberately and carefully omitted, as the Committee is empowered only to set up a test and not to apply it. The Committee does not wish anyone to consider it as a group for setting up market standards.

At the meeting of the Division of Rubber Chemistry held in April, 1939, the Crude Rubber Committee presented some standards which were proposed by the London Advisory Committee for Rubber Research. At that time, the American Crude Rubber Committee expressed itself as being in agreement with the principle of setting standards for crude rubber, but for the reasons stated above, the American Committee could neither approve nor disapprove the standards and limits proposed.

Your Crude Rubber Committee has felt, however, that publication of data obtained from the use or application of any of its standard formulas or procedures would be of interest and possibly of value to technologists both in the United States and abroad, by showing the actual results obtainable from such procedures and thereby stimulate further interest in their use and application.

With this in mind the Committee considered the matter of publishing further information on the variability of rubber in respect to its rate of cure.

In a report of the Committee given in April, 1936, data on the rate of cure of smoked sheets was given to show the extent to which rubber varied, as revealed by the standard recipe. The tests were, however, those of selected samples and might not represent the degree to which the regular run of production might vary. The Committee decided that information on this latter point would be of value.

In order to more clearly show the rubber variation, it was desirable to establish a single basis of comparison, as the introduction of a second basis or variable would complicate the picture to such an extent that confusion would result.

The rate of cure of rubber in the standard recipe can be judged by using definite properties at any of the specified cures. It is necessary, however, to set a single cure, and, a particular property of that cure, if simplification of testing and accuracy of judgment are to result. After careful consideration, the 40-minute cure at 126° C. (260° F.) was selected as sat-

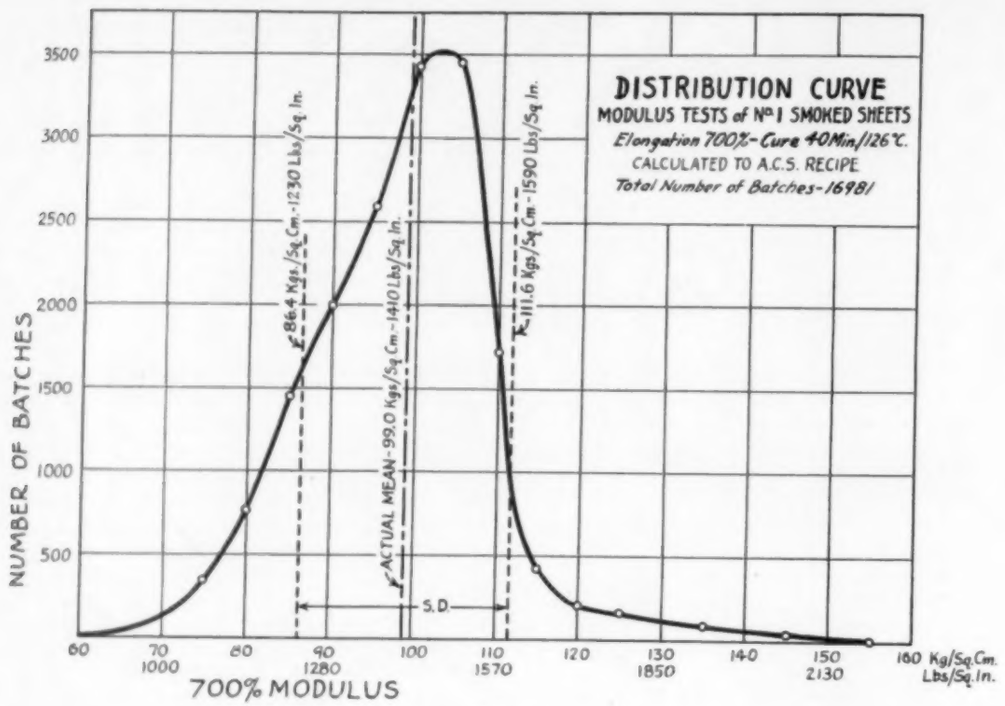


FIG. 1.

isfactory. Shorter cures are apt to exaggerate variation and longer cures repress it.

Up to now, the Committee has suggested that readings of the load at elongations at 500%, 600% and 700% be taken and recorded as well as the ultimate break and elongation. The 500% modulus does not show a great deal of variation, as the load is always small. The 600% modulus is, however, fairly good and has an advantage over the 700% modulus in that the reading is slightly easier to make with a single observer. It does not, however, offer the sensitiveness of the 700% modulus. Ultimate tensile does not truly reflect the stiffness of the stock and its value is seriously affected by a number of factors such as the machine used, the dimensions and shape of the test strip, and others, as shown in the literature.

Taking all things into consideration, the Committee suggests that if the rate of cure is to be compared at a single cure and modulus, the 40-minute cure at 126° C. (260° F.) and the modulus of 700% be used. This suggestion is made without prejudice to any other standards now used and without claiming that such a single cure and modulus exactly reflects the behavior of the rubber at other cures and elongations. The Committee does feel that it is desirable to set such a single set of conditions and that reference to such conditions as standard would be advantageous.

A considerable volume of data, obtained in factory testing of smoked sheets, was made available to the Committee. The only point recorded in these tests was the 700% modulus at the 40-minute cure at 126° C. (260° F.). The results have been assembled in a distribution curve as shown in Figure 1.

The total number of tests involved was 16,981, and the actual average modulus at 700% elongation was 99.0 kgs. per sq. cm. (1410 lbs. per sq. in.). The average deviation (A.D.) was 10.0 kgs. per sq. cm. (142 lbs. per sq. in.). The standard deviation was 12.6 kgs. per sq. cm. (179 lbs. per sq. in.). According to statistical theory, the values within the range of the standard deviation comprise seventy per cent of the total. In other words, seventy per cent of the large amount of rubber tested in this survey had a 700% modulus value between 86.4 and 111.6 kgs. per sq. cm. (1230 and 1590 lbs. per sq. in.). The extreme values found were 60.0 and 155.0 kgs. per sq. cm. (850 and 2200 lbs. per sq. in.).

This data has been presented merely to show the distribution of the 700% modulus value obtained in testing a large amount of No. 1 R.S.S. passing through a single factory and tested under the conditions existing in that factory. The samples were taken from blended batches after plasticizing. If others have records of the test of rubber made on a large scale so that the data could be analyzed statistically, the Committee would be very glad to have whatever information they can give along these lines. It is also hoped that the presentation of this data may stimulate others to investigate this property and in this way our information may be greatly increased.

(7) Determination of Foreign Matter: The Crude Rubber Committee has given considerable serious attention to the determination of foreign material in crude rubber. The usual method of judging the proportion of foreign matter in a given lot of rubber is to draw several samples of the rubber and visually compare it with a given standard. Such a method has been used for years for grading on the market, but it cannot be considered as more than comparative. As a means of judging whether a given lot of rubber could be used directly in the manufacture of rubber materials, such as inner tubes—where a high degree

of freedom from contamination is required—there is no question but that the visual inspection of a sample is of little practical value.

In undertaking this work of developing a test for determining the amount of foreign matter in crude rubber, the Crude Rubber Committee has not had the purpose of bringing out a test which would be a substitute for, or replacement of, the method of market grading. The Committee is only concerned with a test which can be used by the rubber technologists to determine the dirt in any grade of rubber.

Two methods of determining foreign matter have been considered. The first method was based on solution of the rubber in benzol and determination of the foreign material by filtration, washing and weighing. The disadvantages of this method were, first, the use of even a sample of 20 or 30 grams of rubber required the handling of a large volume of inflammable and toxic solvent; second, the determination was tedious because of the viscous solution; and third, the small size of sample rendered duplication difficult because a difference of only one or two grains of sand makes an appreciable difference in results.

The second method was based on a factory process of cleaning rubber. It has the disadvantage of requiring factory equipment and so is not universally adaptable and is also not as precise as a method completely carried out in a laboratory. The Committee presents this latter method of determining foreign matter, merely as a procedure which it feels is of some interest.

It may require modification in order to adapt it to the equipment or needs of various crude rubber consumers, but the essential idea of the test can probably be worked out in most factories. The most advantageous use of rubber of any grade depends to an extent on our knowledge of the properties of that grade, but further than that, a knowledge of the properties of a given lot of rubber enables the user to get maximum value from it. This test is proposed with this idea in mind, and is practical rather than scientific.

Procedure for Estimation of Foreign Material in Crude Rubber

A regular factory washing mill, as shown in Figure 2, is used for this test. The size of the rolls, their speeds, and the type or depth of grooving are not specified, as there are so many variations of these particular items on satisfactory washing equipment that the Committee could not work out or specify any particular size, speed or type. The only requirement is that the equipment must do a satisfactory job of washing rubber.

Just below the rolls of the washer is the usual perforated pan. This catches the larger particles of rubber which are broken off and also protects the screens from damage. Below this perforated pan is a removable pan "C" which has extension sides "B" to prevent any water from escaping before it has passed through the removable screen system "A", which is placed at the lowest point of the pan "C". The area of the screens used depends on the size of mill and the volume of water used, and should not be too large to handle easily. A size found practical for use on a 40-inch wash mill is 15 inches wide and 20 inches long.

The screen system is composed of two separate screens, placed one above the other with a space of about two inches between them. It is recommended that the top screen be 50 mesh, with openings approximately .01 of an inch in diameter. The lower screen should be a 100 mesh screen with openings .0059 inches in diameter. The screen system shown in Figure 2 does not show the lower screen which is placed directly below the one seen.

The following procedure is recommended for carrying out the test, although, as stated before, different conditions may require alteration or modification.

Using a carload as a unit of test, select 20 bales or cases and cut approximately 50 pounds or less from each bale or case, cutting across the edge so that a part of each sheet is included in the portion removed.

The 1000-pound (approximately) sample is taken to the washer fitted with the screens as described above. With the washer well opened, the pieces are passed through to put them in such shape that they are suited for washing.

Care must be used that, after taking the samples, they are not exposed to the danger of picking up dirt in the factory from the floor or from other rubber, as contamination would render the results meaningless.

After cracking the samples, the rolls are set to such an opening that the finished rubber is ¼" thick after the last pass through the washer. The rubber is passed through the rolls six or more times, doubling the rubber on itself each time. The water flow is adjusted so that it passes away through the screen system readily, but using as much water as is practicable. The amount of washing will depend on the mill itself, and the operator will have to determine the exact procedure to obtain satisfactory results on his own equipment.

While it may be argued that occasionally lots of the lower grade may be found which would require more than the standard number of passes set for that grade in order to remove all of the dirt, the use which the operator wishes to make of the test will determine how completely he wishes the washing to be.

After the washing is completed, flush the mill and pans with a hose to force all the foreign material onto the screens. The screens are removed and taken to a laboratory for the completion of the test.

Wash both screens into a suitable container. Much of the material will sink to the bottom but some rubber particles with foreign matter adhering to them, together with some of the wood and bark, will float.

Pour the floating material from the container through a 20 mesh screen held over a 100 mesh screen. This 100 mesh screen need not be the same one used at the washing mill, but is preferably a smaller one which is more convenient to handle in the laboratory. The 20 mesh screen will catch the rubber particles with adhering foreign material, and allow the wood and bark to pass through to the 100 mesh screen. The material on the 20 mesh screen should be examined and any large pieces of wood or bark should be picked off and placed with the material on the 100 mesh screen.

Dry the material retained on the 20 mesh screen at a low temperature (below 50° C.) to avoid making the rubber sticky. After drying rub this material gently over a coarse screen (16 to 20 mesh) to loosen the adhering foreign material, catching it on the 100 mesh screen used above.

The material in the original container is now poured through this 100 mesh screen, rinsing all the heavy substance from the bottom onto the screen.

The 100 mesh screen now contains all the foreign substances found in the 1000 pound sample which are over 100 mesh in size, the rubber having been completely removed. These foreign substances consist of wood, straw or fuzz from the container in which the rubber was shipped, iron scale from the washing mill, and sand, bark and wood which was in the rubber when packed. Except by visual examination, the wood from packing cases can not be distinguished from wood included in the rubber during manufacture.

The residue on the 100 mesh screen is washed with water, dried at 100° C. and weighed and this weight recorded as (a). It is ignited, first at low heat and finally in a muffle, then cooled and weighed and this weight recorded as (b). The loss (a-b) is considered to be the bark, wood, straw or fuzz and is recorded as (c).

The residue after ignition is digested in concentrated hydrochloric acid in a beaker covered with a watch glass, the beaker being placed on a steam bath for several hours or until all the iron is dissolved. The contents of the beaker are washed several times by decantation with distilled water and finally dried in an oven at 100° C. and the weight recorded as (d). The loss in weight is considered as iron scale from the washing mill and not as dirt in the rubber. Tabulated, the test runs as follows:

Carload Lot
↓
20 Bales
↓
1000 lb. Sample
↓
Screen System
↓
Flotation Separation

Heavy Material — Light Material
Light Material → 20 mesh Screen
100 mesh Screen ← Dry and Rub
↓
Dry and Weigh (a)
↓
Ignite and Weigh (b)
↓
Digest with Conc. Hcl
↓
Wash by decantation
↓
Dry and Weigh (d)

Foreign material in 1000 lbs. of Rubber—
Wood, bark, straw or fuzz = (a) − (b) = (c)
Sand = (d)
Total Foreign Matter = (c) + (d)

In order to show some results which have been obtained by the test the following data is given below.

Dirt & Sand In Various Grades of Rubber
(In Grams)

Grade	Total Dirt	Volatile	Sand
No. 1X R.S.S.	3.2	1.2	1.3
No. 1 R.S.S.	4.5	2.5	2.0
No. 3 R.S.S.	14.4	4.4	10.0
No. 4 R.S.S.	18.9	4.2	14.7
No. 5 R.S.S.	44.3	14.0	30.3
No. 2 Brown Crepe	63.7	12.9	50.8
	133.1	48.1	85.0
No. 3 Amber Blankets	22.3	8.5	13.8
	13.8	2.9	10.9
	12.2	6.2	6.0
	142.3	62.4	79.9
No. 4 Brown Crepe	164.4	54.2	110.2

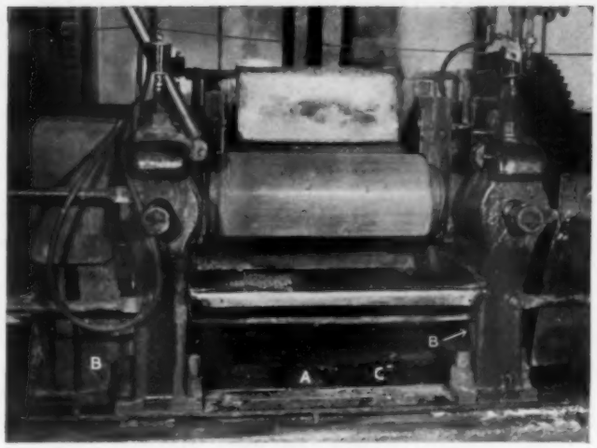


FIG. 2.

These figures are not presented as standards for the various grades and are definitely not to be interpreted as such, but merely as results of some tests made by the given procedure.

The data above shows that different shipments or lots of the same grade of rubber may contain different quantities of foreign material.

The Crude Rubber Committee presents this report with the hope that all members of the Division of Rubber Chemistry will consider all the points covered with serious attention, and if anyone wishes to offer suggestions, comments or criticisms, he will do so by writing directly to the Chairman or any of the Committee members. The same applies to any questions on any of the items. The Committee is particularly anxious to have comments on procedures already offered, including the test for foreign material described above.

The task of drawing up tests or procedures for use of all technologists interested in crude rubber is not an easy one, and while every effort is made to draw up these procedures so that they will be generally useful, without the interest and help of many members, the Committee can neither accomplish the best results nor fully achieve its purpose. Much remains to be done, and with the continued cooperation of the officers and members of the Division, the tasks will be accomplished.

GEORGE SACKETT (Chairman)

E. H. McCOLM — A. H. NELLEN — E. W. OLDHAM
R. D. PARRISH — R. A. SCHATZEL — J. C. WALTON

Neoprene Type GN

A NEW type of neoprene, said to offer the user more than any earlier type, has been introduced by the Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Wilmington, Delaware, under the designation of Neoprene Type GN. Because the new type neoprene is easily plasticizable to any degree of softness the rubber manufacturer can now have complete control of neoprene plasticity. Other advantages cited by du Pont include freedom from odor, lighter color, freedom from staining lacquer, and adaptability to fabrication because of more rubbery tack and fast curing rate.

Editorials . . . . . .

Flexible Regulations

IN anticipation of further difficulties concerning the shipment of rubber from colonies and countries controlled by belligerents in the current European conflict, the Commodity Exchange is taking steps to enable its rules and regulations to be made flexible, so that immediate action by its Board of Governors may be taken in any emergency to meet any crisis which may arise. Occurrences during the last war are indirectly responsible for this move on the part of the Exchange.

Specifically, what the Exchange is seeking is the authority to enable its Board of Governors, by an affirmative vote of at least two-thirds of the members present at any meeting, but in no case less than 12 such votes, to revise, amend, change or modify any existing rules and regulations concerning rubber contracts in the event any foreign government or governments, or subdivisions thereof, restrains, restricts or qualifies the use or disposition of rubber. Or, to put it another way, if these governments establish a control of any kind similar to that in the last war when only a specified number of tons could be imported in any one period of time.

The possibility of British restrictions on exports of crude rubber from the Far East, and even the possibility of the Dutch setting up such restrictions, has been of great concern to the governors of the Exchange for some time. The adoption of any allotment system, such as that in the last war, would seriously interfere with deliveries on outstanding futures contracts on the Exchange. It is to avoid the confusion that would arise on these contracts, among other reasons, that the Exchange seeks authority to have its rules sufficiently flexible so that some immediate action to thwart the confusion might be taken.

The request for the authorization outlined above is incorporated as a by-law in the "new" standard rubber contract which is to be voted upon on May 20. In view of all the surprises which have marked European hostilities to date, it is to be hoped that the Governors of the Exchange will be given the authority they seek.

Reducing Quotas

DESPITE the constant complaint of American rubber manufacturers that there is insufficient rubber on hand and afloat to meet this country's requirements for more than a three-month period, it is generally understood that a "sizable" cut in the export quota for the third and fourth quarters of the year will be made by the International Rubber Regulation Committee at its next meeting scheduled to be held later this month. Permissible exports now stand at 80% of basic quotas, and a cut of 10% is anticipated.

There is also talk of another barter agreement between the United States and England—cotton for rubber—and it is pointed out in some circles that this possibility will forestall a reduction in the quotas. Those more reliably informed on the international situation, however, claim that a reduction will be put into effect this month, and that should another barter agreement be arranged the quota will be raised at a later date to provide for the extra rubber required to fulfill the agreement.

CURRENT NEWS OF THE MONTH

GOVERNMENT'S ANNUAL SURVEY SHOWS RECORD CONSUMPTION

The annual survey conducted by the Leather & Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., results in the estimate that 592,000 long tons of crude rubber were consumed by American rubber manufacturers in 1939, a new high record, which compares with 437,000 tons consumed in the preceding year. Stocks on hand at the year-end are estimated at 125,800 tons, which compares with 231,500 tons at the end of 1938.

The consumption estimate was based on reports received from 521 firms and stocks from reports of 505 firms. Consumption previously estimated by the Rubber Manufacturers Association was set at 577,591 tons and stocks at December 31, 1939, at 140,280 tons.

Based on reports from 300 rubber manufacturers, the Division estimates that consumption of reclaimed rubber reached 170,000 tons, as compared with 120,800 tons in the preceding year. The R. M. A. set this figure at 184,942 tons. Stocks at the year-end, based on reports from 297 firms, amounted to 25,250 tons, which compares with 23,000 tons at the end of 1938 and the R. M. A. estimate of 25,427 tons. Production was set at 186,000 tons for the year by the Division, against 122,400 in the preceding year, and the R.M.A. estimate of 198,815.

Consumption of Synthetic Rubber

Consumption of synthetic rubber, based on reports from 175 rubber manufacturers, more than doubled in 1939, according to the Division's estimate, the figures being 1,700 tons for 1939 and 814 tons in the preceding year. Types of synthetic rubbers which figured in the estimate included neoprene, "Thiokol" and the Bunas. The survey indicated that at least 10 rubber manufacturers in this country are using over 100,000 pounds each per year.

The reported consumption of 592,000 tons of crude rubber included 21,952 tons of latex, reported by 181 manufacturers. In 1938, consumption of 16,161 tons of latex was reported by 147 firms. These latex consumption figures are incomplete, the Division points out, because a single figure for crude rubber consumption was reported by certain known important users of latex. Five firms reporting the largest amounts accounted for 14,070 tons, and six more firms each using over 500,000 pounds accounted for 1,850 tons.

Rubber Belting Gains

Although rubber and leather belting were on the same footing in 1929, according to the Census of Manufactures, with sales of $25,776,000 and $25,624,000, respectively, rubber belting has made considerable headway since, the figures for 1937, the latest available census data, revealing sales of $32,060,000 for rubber belting and only $14,715,000 for that of leather. Sales of rubber belting in 1939 are estimated at more than $35,000,000 by Paul W. Van Orden, manager, belting division, B. F. Goodrich Co.

DUAL AWARD OF COLWYN MEDAL TO SCHIDROWITZ AND STEVENS

The Council of the Institution of the Rubber Industry, of London, England, has decided to make a dual award of its Colwyn Medal for the year of 1940 to Dr. Philip Schidrowitz and Dr. H. P. Stevens. The Colwyn Medal, awarded for valuable contributions to rubber science and technology, is one of the highest honors in England. The presentation will be made at the Annual General Meeting and Dinner of the Institution, to be held on May 22 at the Connaught Rooms, Great Queen St., London, W. C. 2, England.

Dr. Schidrowitz, who is probably best known for his development of vulcanized latex, received his education at the University College School, in London, the Swiss Federal Polytechnic, in Zurich, and the University of Berne. He first took up the study of rubber chemistry and technology about 1904, and is the holder of many patents and has contributed dozens of articles to the technical literature. He is a vice-president of the I. R. I. and a past chairman of its Examinations Board. He is also one of the consultants to the Rubber Growers Association.

Dr. Stevens was born in London in February, 1875, and received his education at the Merchant Taylors' School, St. John's College, Oxford, Strasbourg, Bonn and Heidelberg, receiving his Ph.D. from the latter institution. He is the author of many technical books on rubber and other subjects, and has been a consultant to the Rubber Growers Association for many years. He is also a Fellow of the I. R. I.

HALF-YEAR EARNINGS LAGGING BASED ON LOW PROFIT MARGINS

After having established a new record for annual crude rubber consumption in 1939, the domestic rubber manufacturing industry has continued to operate at a high rate since the beginning of 1940, according to the latest monthly survey of the Research Department of Fenner & Beane, New York brokerage. While replacement tire sales scored an unexpectedly sharp recovery in 1939 and total tire shipments were closely in line with output, earnings failed to regain the level attained in 1936 and the first half of 1939.

Output of miscellaneous rubber goods tended to lag in the earlier part of 1939, while profit margins in the replacement tire division were narrowed in the second half of the year by a fresh outbreak of competitive price cutting and by increased raw material costs. Aggregate net income of five companies amounted to $35.5 millions compared with $20.6 millions in 1938.

Replacement Tire Sales Drop

Crude rubber consumption in the first quarter of 1940 totaled 155,002 tons, or 11.7% in excess of that in the initial three months of 1939. Shipments of original equipment tires and of miscellaneous automotive parts were higher in line with the larger automobile output of the period. Replacement tire sales, however, ran 6.7% below those of a year previous. Recent official statements indicate that the net gain in physical and dollar sales volumes has been insufficient fully to offset the lower profit margins now prevailing; earnings comparisons for the current half-year are expected to be on the unfavorable side in consequence. Although minor adjustments have been effected, the industry has not found it feasible to make a general increase in tire prices as yet.

While tire shipments continue to account for about 60% of annual sales volumes, the success individual companies have met with in developing new rubber applications is an encouraging factor from a longer term point of view. Profit trends, however, remain subject to erratic variations, for changes in raw material costs are intensified by the relatively large leverage provided by heavy depreciation and senior capital charges. With the greater part of the country's crude rubber supply secured from the Far East, war problems present a special current risk, the survey concludes.

COMMODITY EXCHANGE SEEKS REGULATION FLEXIBILITY

The adoption of a new by-law which would authorize the Board of Governors of the Commodity Exchange, Inc., to amend, change or modify existing rubber rules and regulations in such manner as to conform with the restrictions on rubber imposed by a foreign government has been proposed by the Exchange and will be voted upon on May 20. Such authorization, it is said, would provide for the contingency of foreign restrictions on the free flow of crude rubber to this country during the duration of European hostilities.

The possibility of British restrictions on exports of crude rubber from the Far East, similar to the rules adopted during the last war, is being regarded with some apprehension in Commodity Exchange circles, since adoption of a British allotment system for crude rubber might seriously interfere with deliveries on outstanding futures contracts on the Exchange.

Under the proposed new rule the Board of Governors of the Exchange would have the power to restrict deliveries on contracts without jeopardizing the whole market. One way of doing this would be the establishment of an allotment system. Such changes in the rules would be binding upon all contracts entered into before as well as after their adoption.

If adopted, this rule, in conjunction with present rules which apply in the event of squeeze conditions in the market, is believed to be sufficient to safeguard the Exchange against all possible emergencies. In a further attempt to forestall the development of squeezes due to short supplies in deliverable grades, the proposed new standard rubber contract provides for four grades of deliverable rubber, previously outlined in this journal.

REPORT DEVELOPMENT OF BULLET-RESISTING TIRE

According to a statement made by Major-General C. M. Wesson, Chief of Ordnance, U. S. Army, to the Appropriations Committee of the House of Representatives in Washington on April 3, pneumatic tires with tubes which can withstand gunfire have been developed. The tires, he said, were the result of a cooperative program participated in by Goodyear, Goodrich, Firestone, U. S. Rubber and Seiberling. The new type tire was one of many items developed for national defense by private industry in a close-working bond with the Army, according to Major-General Wesson.

The Major-General did not describe the bullet-resisting tires, but it has been generally known in the rubber industry for some time that various tire manufacturers have been working on pneumatic tubes capable of resisting gunfire. One of the first tubes of this type was that produced by Seiberling in which the outer tube is walled inside by a series of rubber compartments or bulkheads, which contain a soft, uncured rubber compound. When punctured, the tube seals itself when this compound is squeezed into the hole and cured by frictional heat and contact with the air.

Shortly after Major-General Wesson's disclosure to the Appropriations Committee, the production of a bullet-resistant, self-healing tire tube for military vehicles was announced by F. B. Davis, Jr., president, United States Rubber Company. Mr. Davis, who made the announcement to the company's stockholders at their annual meeting on April 16, said that in a test the new tube lost little of its carrying efficiency despite penetration by 29 "Thirty" calibre rifle bullets.

Mr. Davis also disclosed that sale of the tube to foreign armies has been approved by the War Department, subject to State Department policies. Furnishing of the tubes to law enforcement agencies and recognized armored car companies engaged in the transportation of money and other valuables in the United States has also been approved, the approval specifying that no re-sale may be made by such companies.

Commercial Rubber Grinding

Due to the increased use of ground scrap in compounds for various types of rubber products, there has developed of late a field for the commercial grinding of such scrap for rubber manufacturers who are not equipped to do their own grinding. One concern which is specializing in the commercial grinding of cured rubber scrap is that of A. C. Wheeler, 5-17 Forty-Sixth Road, Long Island City, N. Y. Mr. Wheeler advises that his plant is equipped with the latest type of grinding equipment and invites rubber manufacturers to discuss their scrap grinding problems with him. His telephone number is STillwell 4-6707.

Division Meets September 12-13

The Fall Meeting of the Rubber Division, A.C.S., will be held in Detroit on September 12 and 13, with headquarters at the Book-Cadillac Hotel. The technical sessions will be held at Masonic Hall. The banquet will be held on September 12. Papers or abstracts should be sent no later than July 13 to H. I. Cramer, c/o Akron University, Akron, Ohio.

SOME SCENES FROM THE RUBBER DIVISION MEETING IN CINCINNATI

UPPER LEFT: H. I. Cramer (Secretary, Rubber Division), Charles L. Parsons (Secretary, A.C.S.), and G. L. Allison (Goodrich) in a huddle. UPPER RIGHT: C. W. Christensen (Treasurer, Rubber Division), R. T. La Porte (Seiberling), P. P. Tillinghast (N. J. Zinc), G. L. Allison (Goodrich), and Wm. I. Burt (Goodrich) charmingly pose for the photographer. LOWER LEFT: W. O. Hamister (Naugatuck), H. Karg (Master Tire), J. C. Wood (Vanderbilt), J. H. Rollins (Master Tire), J. H. Doering (Ford), H. A. Hoffman (DuPont), D. C. Scott (Henry L. Scott Co.), P. P. Pinto (Rubber Age), and G. S. Haslam (N. J. Zinc) gathered round the festive board. LOWER RIGHT: C. P. Hall, Sergeant-at-Arms of the Rubber Division, challenging Lugh Johnson (Johnson Rubber), who showed up without his badge. Photographs by Allyn K. Thayer.

PRESIDENT OF SEIBERLING SEES 1940 AS INDUSTRY'S BEST YEAR

Barring unforeseen eventualities, the current year should be one of the most prosperous years in the history of the domestic rubber industry, J. P. Seiberling, president, Seiberling Rubber Co., told a group of the company's tire dealers at a meeting held at the Park Central Hotel in New York City on April 23. The meeting was one of many held throughout the country by the company.

"Conditions have improved and they are going to be better," Mr. Seiberling said. "People are going back to work with their incomes restored. They're going places, doing things and—they are buying.

"I believe all lines of endeavor are going to forge ahead in 1940. The rubber industry, with which I am most familiar, I know will make appreciable gains. This prediction is based on facts.

"Truck and passenger car registrations are climbing at a rapid rate," continued Mr. Seiberling. "The sale of both new and used cars continues at a high level. This plus the greater consumption of gasoline means there are more automobile tires rolling farther and faster every month. That means tires are wearing out faster—which in turn means more sales and more jobs in the rubber industry."

Discusses Indies Situation

Referring to the warning served on Japan and the rest of the world by President Roosevelt and Secretary of State Hull on April 18 to keep hands off the Netherlands East Indies, the Seiberling executive stated that if Japan should seize the Netherlands East Indies and cut off American crude rubber supplies, there would be a serious immediate problem in meeting our needs, but from a long-range viewpoint a substitute source of supply could be developed in Brazil.

Although he did not think Japan would be "brash" enough to try to take the rubber islands, Mr. Seiberling said this was possible if Japan, Russia and Italy all decided to "jump on" England and France at the same time in active support of Germany. If Japan did so, he continued, the United States might send a fleet to the Philippines, and a serious situation might develop with respect to our rubber supply.

Seeks Raincoat Cloth Agency

Ralph L. Charney, Casilla 1943, Santiago, Chile, is interested in securing the agency in that country for the raincoat cloth of some American manufacturer. He advises that he has been representing English and German manufacturers for the past twenty years. A report on Mr. Charney is available from the World Trade Directory Division, Department of Commerce, Washington, D. C.

Coming Events

June 4. Los Angeles Rubber Group, Hotel Mayfair, Los Angeles.

June 9-14. Society of Automotive Engineers, White Sulphur Springs, W. Va.

June 14. New York Rubber Group, Annual Outing, Green Meadow Club, Harrison, N. Y.

June 17-21. American Society of Mechanical Engineers, Milwaukee, Wisc.

June 24-28. American Society for Testing Materials, Atlantic City, N. J.

July 19. Boston Rubber Group, Annual Outing.

Sept. 12-13. Rubber Division, A.C.S., Annual Meeting, Book-Cadillac Hotel, Detroit, Mich.

Oct. 7-11. National Safety Congress, Stevens Hotel, Chicago, Ill.

COTTON GROUP LAUNCHES AN EXTENSIVE RESEARCH PROGRAM

In an effort to develop a cotton cord for automobile tires with heat durability equal to that of rayon cords, which would reinforce the advantages cotton now has in lower cost and greater moisture resistance, the National Cotton Council has launched an extensive research program through its Cotton Research Foundation and the Mellon Institute.

Launching of the program was revealed at a convention of the National Cotton Council recently held in New Orleans. Oscar Johnson, president, made mention of the program in discussing how cotton men evaluate their major markets. He said that the present annual use of cotton in automobile tires amounted to 460,000 bales, that there was a possibility that this might be reduced to approximately 210,000 bales because of the use of rayon cord in truck tires, but that if the research program produced a cotton cord with the sought for qualities there was a good possibility of increasing the annual amount consumed to approximately 510,000 bales.

At the present time, it was also stated, the passenger car tire business is not endangered insofar as the cotton market is concerned, but a partial offset to this is the prospect that cotton will lose some automobile seat business to the new latex foam sponge rubbers.

Celebrates 100th Anniversary

Emery Industries, Inc., Cincinnati, Ohio, is celebrating its 100th anniversary this year. The company, which today is one of the largest manufacturers of stearic and oleic acids, several brands of which find application in the rubber industry as softeners, dispersing agents, etc., started in a one-story building in Cincinnati in 1840, producing lard oil.

"CORRECTIVE TREND" IS SEEN BY LITCHFIELD OF GOODYEAR

Having indulged in "too much national extravagance and experimentation," the country now is enjoying a "corrective trend" which will carry us to safer ground, P. W. Litchfield, president of the Goodyear Tire & Rubber Company, told a group of the South's industrial leaders at Gadsden, Alabama, on April 29.

In a public address following a meeting of the company's board of directors, Mr. Litchfield recalled the progress made since Goodyear established a plant in Gadsden ten years ago. Since that time, he pointed out, the Gadsden plant has turned out more than 18,000,000 tires, and has an annual payroll in excess of $2,000,000. The last of several plant additions was completed two months ago, representing a $250,000 investment in additional tire capacity.

Largest consumer of southern grown cotton in the rubber industry, Goodyear bought and used more than 60,000,000 pounds last year, Mr. Litchfield said. Practically all of the fabric used in his company's tires and other products is woven in the South.

Cites New Product Developments

Citing the development of new products and new markets monthly, he said that a 20-mile-long belt now being built by the Goodyear company for the Shasta Dam project in California, will contain half a million pounds of Southern-grown cotton alone.

Mr. Litchfield recalled the time in the early 1930's "when our economic machinery went out of gear with such clashing and grinding as to frighten the nation." During that time, he said, a school of thought developed around the basic idea "that America's job of building had been completed and from now on our concern should be with the administration or operation" of what already had been created.

"Although we have recovered from the shock of that acute crisis," he continued, "there remain those who cling to the theory of the status quo and preach the need for regimentation and centralized control. Deliberately or ignorantly they seek to mislead us, but we need have no fear. America is not a land where comfortable apathy can hold out for long. It is the nature of Americans to drive ahead, and we need look about us only briefly to be convinced that there is much yet to be done."

The future of the rubber business and all other business "holds great promise if we will shake off our national fears and go forward," Mr. Litchfield concluded.

Murray C. Bartlett, of the Canadian Goodrich technical staff, on May 1 was transferred to the Akron plant for a two year stay.

NEW YORK GROUP OUTING SET FOR FRIDAY, JUNE 14

The Annual Outing of the New York Group, Rubber Division, A.C.S., will be held this year on Friday Afternoon, June 14, at the Green Meadow Club, Harrison, Westchester County, N. Y. Activities are scheduled to get under way by 1:00 P.M. Members of the group voted overwhelmingly recently to have the outing on a Friday afternoon rather than Saturday as in the past.

Tickets for the outing, which include either a steak or fish dinner, are $2.00 for members and $3.00 for non-members and guests. There is an extra fee of $1.50 for golfers. Tickets can be secured in advance from and reservations made with Peter P. Pinto, c/o RUBBER AGE, 250 West 57th Street, New York City, secretary-treasurer of the group. The Green Meadow Club is prepared to serve luncheons from 85 cents up for those who come early.

J. de C. Van Etten, of Vansul, Inc., Chairman of the Outing Committee, has arranged for a complete roster of activities, as follows, the individual names shown being those in charge of each event: *Golf*—F. F. Salamon (Binney & Smith); *Clock Golf*—A. R. Kemp (Bell Telephone Labs.); *Soft Ball*—J. Miscall (Flintkote); *Boccie*—J. H. Carroll (R. E. Carroll, Inc.); *Tennis*—M. E. Lerner (RUBBER AGE); *Darts*—S. C. Stillwagon (*India Rubber World*); *Baseball Throw*—S. G. Byam (DuPont); *Horseshoe Pitching*—W. F. Lamela (Okonite); *Tug-of-War* — Wallace W. DeLaney (Seamless Rubber).

The Green Meadow Club, one of the most beautiful clubs in the Westchester area, features a golf course originally laid out by one of the greatest golf architects in America. Through an arrangement of double tees, it may be played as a Short Course of 6,037 yards, or as a Championship Course of 6,527 yards, par for the courses being 70 and 71, respectively. Invitation tournaments are played annually at the club. It may be reached by auto or train, as follows:

By Auto: *From George Washington Bridge*—north on Henry Hudson Parkway to Cross County Parkway to Hutchinson River Parkway to North Street, Harrison. *From Whitestone Bridge*—to Eastern Boulevard to Hutchinson River Parkway to North Street, Harrison. *From Connecticut*—via Merritt Parkway to Hutchinson River Parkway to North Street, Harrison (about 4 miles below the state line). A map will accompany announcements to be sent to members and others shortly.

By Train: From lower level of Grand Central Station by New York, New Haven & Hartford. Trains leave every half-hour, 25 and 55 minutes after the hour, to Harrison. Running time is 47 minutes. Taxis at the Harrison Station to the club are available.

Members and others planning to attend the outing are urged to either purchase their tickets in advance or at least make reservations so that proper facilities for all may be provided. Those who cannot attend during the afternoon are urged to come for dinner. The 5:25 P.M. train from Grand Central will enable such members to arrive in time. Golfers, incidentally, may play all day if they so desire.

Used Tires for Farm Vehicles

When Sears-Roebuck announced a line of farm equipment, including hayloaders, mowers, hand carts, farm wagons, and trailers, equipped with used tires a few months ago, skeptics dismissed the announcement as a "stunt." That the use of such tires on farm vehicles is developing into a major trend is now recognized, particularly in view of the fact that the International Harvester Co. has made known the fact that it is attempting to standardize wheel sizes of certain implements in order that farmers may equip these machines with second hand tires.

L. D. CARVER, OF DUNLOP TIRE, HEADS CANADIAN RUBBER GROUP

L. D. Carver, chief chemist, Dunlop Tire & Rubber Goods Co., Ltd., was elected chairman of the Rubber Section of the Canadian Chemical Association, at the final 1939-40 meeting of the Section, held at Walper House, Kitchener, Ontario, on April 26. R. B. Symons (Canada Wire & Cable) was elected secretary-treasurer. B. M. Costello (Canadian Goodrich) was appointed to the Program Committee, along with T. Batty (Firestone) and J. C. Howard (Kaufman Rubber), who were renamed.

The principal speaker at the meeting, which was attended by approximately 40 members and guests, was S. D. Frost, of the North American Cyanamid Co. Mr. Frost discussed the occurrence and production of limestone in the Thames river valley section of Ontario. Of particular interest was his description of the novel engineering methods developed two years ago to reclaim the quarries after a sudden terrific flood had inundated them to a depth of a hundred feet with fifteen million gallons of water.

E. F. Riesing, Detroit, who was originally scheduled to address the meeting on "The Use of Rubber for Vibration Dampening" was unable to do so when stricken with an appendicitis attack.

Preceding the talk, the members were entertained with fishing and camping movies in color by J. C. Howard, speedboat enthusiast and chief chemist of the Kaufman Rubber Company.

LOS ANGELES RUBBER GROUP HEARS TALK ON "PLIOLITE"

A talk on "Pliolite" by Fred Woerner of the C. P. Hall Company was the leading feature of the program at the monthly supper meeting of the Los Angeles Group, Rubber Division, A.C.S., at the Mayfair Hotel on Tuesday, May 7. Mr. Woerner went into detail on the chemical composition of the product and showed a large number of articles in the manufacture of which Pliolite plays an important part.

He emphasized especially its use in coating paper and showed a number of articles made from paper so treated. Cheese manufactured by a local cooperative and wrapped in paper so coated was put on exhibition. Mr. Woerner's talk was complete in detail.

A second number on the program was the showing of a talking picture, "The Cavalcade of Chemistry" by Herman Jordan of the Rubber Chemicals Division of E. I. du Pont de Nemours and Company, Inc. The picture covered some of the most recent developments in chemistry and gave some interesting views of the World's Fair in New York.

The attendance of 106 was one of the largest for the season and the amount of money taken in for the treasury was the greatest in many months.

The door prize, a table radio, donated by the Monsanto Chemical Company through Art Kroeger, was won by Cliff Neville of the U. S. Rubber Company. The special prize, another radio, was won by Russell Olds of Olds Alloys, Pasadena. This was given by the Martin, Hoyt and Milne Company through their local representative, Monty Montgomery.

The table favor placed at the plate of each guest was a "Flex-Ray", a patented device equipped with battery, light, and Lucite light conveyor, intended as a tongue depressor for the examination of throat and tonsils. This was secured through the efforts of Mr. Jordan.

Physicians from the staff of the Los Angeles County General Hospital showed several plastic models illustrating the technique of modern surgery and showing the appearance of cancer in different stages.

In the absence of the chairman, W. C. Holmes, the program chairman, Leon L. Horchitz, presided. The next meeting, which will be the last one of the season, will be held in the same hotel on Tuesday, June 4. A summer fishing trip is in prospect and Ed Royal has been named head of a committee on arrangements. A large number of guests and several new members were introduced.

Beverly Lewis, who has been connected with the Dunlop Tire and Rubber Goods Company since his graduation from the University of Toronto in 1937, will this month take up his new duties as chief chemist of the British Rubber Company of Canada, Ltd., Montreal.

GOODRICH AND DUPONT HOLD PREVIEWS OF FAIR EXHIBITS

Previews of their 1940 exhibits at the New York World's Fair were held on the Fair grounds by the B. F. Goodrich Company and E. I. du Pont de Nemours & Co., Inc., on Tuesday, May 7, and Friday, May 10, respectively.

The new Goodrich exhibit has been considerably expanded and several new attractions, designed to appeal to the lay public, have been included. The displays feature a new and stronger cord conveyor belt, an advanced method of building rubber footwear, the new Silvertown tire, Air-Cell latex mattresses, and the actual compounding and manufacture of Koroseal.

Many popular features of the 1939 exhibit, including the 60-foot tire guillotine, manufacture of latex gloves by the Anode process, demonstration of the Vulcalock process, and displays of several hundred of the company's mechanical, drug sundry, toy, footwear and other rubber products, are retained.

The major attraction of the Goodrich exhibit will again be the presentation of the "gas-and-rubber rodeo," in which Jimmy Lynch and his well-known troupe of "death dodgers" will demonstrate the non-skid and other features of Goodrich tires. The "rodeo" this year includes two comely young ladies who put the automobiles through the same series of hair-raising stunts as do the male drivers. The highlight of the preview came when the two girls, dressed as "Girls of the Golden West," jumped cars through elevated hoops on the banked track of the open air arena.

The 1940 "Wonder World of Chemistry," the exhibit of the du Pont company, ably illustrates the progress made toward a self-sufficient America, one no longer dependent upon foreign sources for essential materials. Headlining the newest developments shown is a comprehensive display of nylon. The story of its development is portrayed from its birth in the laboratory to its appearance in the form of hosiery, bristle-like filaments for brushes, and other products. Other displays relate the story of chemical contributions in rubber, plastics, ink, upholstery, paints, electroplating, etc. Laboratory apparatus is faithfully reproduced to show how chemists test and evaluate materials. A dramatic stage spectacle, indicating how important chemistry is to the average individual, is part of the exhibit.

The section of the du Pont exhibit devoted to neoprene is devoted to the presentation of several laboratory tests involving neoprene and crude rubber products, designed to show the superiority of the former material in certain applications. Gloves are immersed in furniture polish, giant sink scrapers are dipped in kitchen fats and grease, strips of hose are subjected to flexing, and thin strips of neoprene and rubber are exposed to concentrated ozone in a specially constructed ozone chamber which employs a "Jacob's Ladder" spark gap to generate gas.

Another "Worn Tire" Law

Governor Vanderbilt of Rhode Island signed a law recently providing a $10 fine or five days in jail for any motorist convicted of driving with worn tires. Tires, according to the law, must not show breaker strip, cushion gum or fabric. The new law is part of the highway safety program of Rhode Island, which has earned the title "the safest state." Pennsylvania has a somewhat similar law.

Industrial Physicians Plan Meeting

The 25th Annual Meeting of the American Association of Industrial Physicians and Surgeons, together with the 1st Annual Meeting of the American Industrial Hygiene Association, will be held at the Hotel Pennsylvania in New York City on June 4-7, 1940. The four-problems of industrial health.

Moving Tire Valve Unit

The new tire valve manufacturing unit of the Ohio Injector Company will be moved in the next month or so from the present plant in Wadsworth, Ohio, to the factory formerly occupied by the old Avalon Rubber Company on the Sterling-Rittman Road, northeast of Sterling, Ohio. Work on remodeling the plant is already under way. William E. Goff, former tire valve salesman of Akron, and inventor of the new type valve being made by Ohio Injector, is directing sales of the valve.

Improved Lubrex Available

An improved form of Lubrex, the mold lubricant and dust eliminator brought out about five years ago, has now been made available by the Standard Chemical Company, of Akron, Ohio. Lubrex, according to its manufacturer, helps keep molds bright and clean, does not build up a film, and helps molds to "break" easily. It also is said to eliminate flying dust when used instead of dusting powders on uncured stock.

Changes at Columbian Carbon

At a recent meeting of the board of directors of the Columbian Carbon Company held in New York, F. F. Curtze, president, was made chairman of the board, and Reid L. Carr, executive vice-president, was elected president. A. F. Kitchel, H. H. Reardon and R. M. Hillas were made vice-presidents, and W. D. Hearn was elected secretary.

"SYNTHETIC RUBBER" SEMINAR BROADCAST BY COLUMBIA CHAIN

A so-called synthetic rubber seminar was broadcast over 120 stations of the Columbia Broadcasting System on March 21. Participating in the broadcast were Dr. W. L. Semon, of the B. F. Goodrich Co., inventor of Koroseal, and Dr. J. W. Patrick, of the Thiokol Corporation, discoverer of "Thiokol."

Dr. Patrick first told of the discovery of "Thiokol." He was working in his laboratory in Kansas City in 1925 trying to devise a new way to make an automobile anti-freeze solution and mixed two chemicals—ethylene dichloride and sodium polysulfide—and instead of getting a new liquid which might prevent automobile radiators from freezing he discovered a gummy-looking mass in the laboratory beaker, which proved rubbery on examination. Later experiments with this chemical mixture resulted in the development of "Thiokol."

Dr. Semon then traced the development of Koroseal. He related how he was assigned the problem of developing a rubber-like material from a non-rubber source back in 1926, how he first made vinyl chloride from ordinary lime, coke and salt, and finally how a product superior to natural rubber in certain respects was secured by removing the chlorine from the vinyl chloride by means of heating with a solvent and cooling. He also discussed several current applications of Koroseal, pointing out inherent advantages over natural rubber in these applications.

Macy's Adds Tires to Line

R. H. Macy & Co., New York's largest department store, has put in a line of tires made for it by one of the leading tire manufacturers to be sold under the "Supre-Macy" brand. The prices at which they will be retailed, according to Macy officials, will make the 40% off list "an every-day low price with no special deals." Typical quotations are $9.44 for size 5:50 x 17, against list price of $15.45 for comparable quality, according to the company; $9.74 against $15.75 for size 6:00 x 16; and $10.44 against $17.65 for size 6:25 x 16. An 18-month guarantee is given on each tire.

New Plant for Midland Rubber

Midland Rubber Co., Cedar Rapids, Iowa, has purchased a 20-acre factory site on Cedar Lake, near that city, and will start construction of a new $25,000 plant shortly. One acre will be used for the first building, according to B. A. Ruhling, president, and the rest of the property will be retained for future expansion. Midland Rubber, which manufactures window stripping, rubber bushings, and other specialties, is reported to be working night and day at present to fill its orders.

SEEK TO HALT DISSOLUTION OF GILLETTE RUBBER COMPANY

A group of 32 minority stockholders of the Gillette Rubber Co., Eau Claire, Wisconsin, filed a petition with the Circuit Court at Eau Claire on April 22 seeking a temporary injunction to prevent the United States Rubber Company, majority stockholder, from continuing the dissolution and liquidation of that company. Gillette stockholders voted for the liquidation of the firm and its acquisition by U. S. Rubber at a meeting held on February 29, with the latter voting approximately 80% of the Gillette common stock.

As a basis for the petition, the plaintiffs contended that the transaction through which U. S. Rubber took over Gillette was "fraudulent and unlawful" and that the price paid ($29.00 per share to minority stockholders) was "arbitrary and unfair." S. C. Nierman, Chicago, one of the attorneys for the petitioners, charged U. S. Rubber with canceling contracts held by Gillette and failing to renew other contracts, and also with using the Gillette plant to fill its own orders leaving Gillette without sufficient plant facilities to fill its own orders. This, he contended, acted to the detriment of the minority stockholders.

In defending U. S. Rubber's position, Arthur Wickham, Milwaukee attorney, stated that the reason for liquidation of Gillette was to evade double taxation and also to avoid possible law suits and criminal prosecution under the Robinson-Patman Act. He argued that of the $21,000,000 worth of business done in 1939 by Gillette, approximately $14,000,000 came from U. S. Rubber. He denied the allegations of fraud. The petition was taken under advisement by Judge George Thompson.

LARGER RESERVES OF RUBBER URGED BY P. W. LITCHFIELD

National attention should be turned to development of a source of rubber supply within the Western Hemisphere and at the same time the barter exchange of cotton for rubber should be extended to provide adequate reserves of the raw material, P. W. Litchfield, president of Goodyear Tire & Rubber Co., told stockholders at the annual meeting in Akron on March 25.

Mr. Litchfield pointed out that for the most part United States rubber supplies come from the vicinity of the Malay peninsula, half way round the world. Islands on which such rubber is grown are in the hands of the British and Dutch, who "may be expected to make every effort to protect their trade against interruption," he explained.

For this reason it seems unlikely that a shortage will develop in the immediate future, but "there is just enough potential danger in the situation in view of the fact that an acute rubber shortage would bring untold grief to this country," that supply and reserves should be further assured, the speaker emphasized. Experimental work by Goodyear on Central American plantations proved that rubber can be grown as well in Latin-American countries as in the Far East, he said.

Discussing war and its effect on the rubber industry, Mr. Litchfield said that the first move by Goodyear to meet the situation had been to limit sales to foreign customers in such a way as to avoid speculation. Normal requirements were filled as usual, but care was taken not to exhaust inventories at currently low prices.

News Briefs

Tire exports during 1939 were valued at $16,349,000, as compared with $11,339,000, according to the Foreign Commerce Department of the Chamber of Commerce of the United States. It was the best export year since 1931.

Pliofilm is being fashioned into experimental gas-proof clothing in French factories, according to C. G. Jerosch, former European manager for Goodyear, who now operates a factory in Paris where Pliofilm clothing is made.

The New York office of the Brown Company, manufacturers of midsoles, among other products, has been moved to 500 Fifth Avenue.

B. F. Goodrich Co. has signed a new contract with Local 5 of the United Rubber Workers of America. The contract has been approved by the union.

A new way to cast small metal parts in inexpensive rubber molds is interestingly described in the April issue of *Witcombings*, house organ of Wishnick-Tumpeer, Inc.

A $200,000 Industrial Progress Program, providing monetary awards for improvements in machinery and processes of various kinds, has been launched by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Complete details may be secured direct from the Foundation.

Firestone has begun the construction of a hydro-electric plant on the Farmington River in Liberia to supply the needs of its rubber plantations in that country. It is the first time in history that one of West Africa's rivers is being harnessed to bring light and power to deep jungle land.

Falls Rubber Co., Findlay, Ohio, has entered into a stipulation with the Federal Trade Commission concerning the marking of certain tires, patricularly with regard to markings relative to the actual number of plies.

FRENCH RUBBER CONFERENCE WILL BE HELD THIS MONTH

Despite the chaotic conditions abroad, a rubber conference will be held in Paris on May 16, 17 and 18. It will be held under the presidency of M. Louis Rollin, former French Minister of Colonies. Sir George Beharrell, Chairman, Dunlop Rubber Co., Ltd..; H. Eric Miller, Chairman, Harrison & Crossfield, Ltd.; and Sir Walrond Sinclair, President, Institution of the Rubber Industry, will act as vice-presidents.

Although it is realized that under present conditions it will not be able to organize a conference with any semblance of full attendance, it is hoped that a large number of technical papers will be secured, many of which will be read by appointed deputies in the absence of the authors themselves. Subjects to be treated with include history of the plantation industry; production; use and manufacture; synthetics; reclaimed rubber; and latex.

All papers, according to present plans, will be translated in English, French and Dutch, and will be published subsequently in brochure form. The official opening of the French Rubber Institute, now housed at 42 Rue Scheffer in Paris, will take place during the conference.

The Paris Conference will be held under the auspices of the following associations: Association Francais des Ingenieurs du Caoutchouc et autres Matieres Plastiques; Syndicat du Caoutchouc et des Industries qui s'y rattachent; Union des Planteurs de Caoutchouc en Indochine; Institut Francais du Caoutchouc; and the British Rubber Producers Research Association.

Detroit Holds Spring Meeting

Approximately 150 members and guests attended the Spring Meeting of the Detroit Group, Rubber Division, A.C.S., held at the Hotel Leland in Detroit on April 26. J. V. Hendrick, of the Chrysler Corporation, discussed "Synthetic Rubber in the Automotive Industry," and E. J. Kvet, of the Baldwin Rubber Co., substituting for L. A. Danse, of the Cadillac Motor Co., delivered a talk on "A.S.T.M.-S.A.E. Standardization of Automotive Rubber." Both talks were well received.

Buffalo Rubber Group to Meet

A meeting was held on April 24 at the home of B. W. Wetherbee, of the Globe Woven Belting Company, to prepare for the first meeting of the newly-organized Buffalo Rubber Group sometime later this month. Included among those present were Michael Berman (Hewitt), Warren Jones (General Cable), John S. Plumb (U. S. Rubber Reclaiming), W. R. Sheridan (Dunlop), and Mr. Wetherbee. Mr. Plumb was selected as temporary chairman until officers are elected.

FINANCIAL NEWS

GENERAL CABLE STOCKHOLDERS TO VOTE ON RECAPITALIZATION

Stockholders of the General Cable Corporation will vote on details of a recapitalization plan at a special meeting to be held in Jersey City on May 23. An announcement giving the full details, together with the management's recommendations, has been mailed to all holders of the company's preferred, Class A and common stock.

Under the proposals the corporation's 150,000 shares of 7% cumulative preferred stock would be changed into a like number of 4¼% cumulative preferred shares and 1,200,000 common shares. The basis of exchange would be one share of new 4½% preferred and eight of common for each share of presently outstanding preferred.

The 306 shares of Class A stock outstanding as of April 1, 1940, would be changed into 1,226,756 common shares. Basis of exchange would be four shares of common for each Class A share. The total of common will be less if any Class A should be converted into common between April 1 and the effective date of the plan. Holders of common stock will retain their present ownership.

Under the present set-up General Cable has annual dividend requirements of $1,050,000 on its preferred stock, a heavier charge against earnings than the corporation can regularly meet. Accordingly, unpaid dividends have accumulated amounting to $49.00 a preferred share, aggregating $7,350,000 as of February 1.

It was pointed out that holders of the preferred stock have enjoyed little if any tangible benefits from their preferential rights, while holders of Class A and common stock have received no benefits due to the accumulation of unpaid dividends. The recapitalization plan is intended to rectify this situation.

Baldwin Rubber Company

First Quarter: Net profit of $109,875, equal to 35 cents each on 316,757 shares of common stock, which compares with $120,559, or 38 cents a share, in the corresponding period of 1939. For the six months ended March 31, 1940, Baldwin reports a net profit of $270,553, equal to 85 cents a share, which compares with $277,402, or 87 cents a share, in the same period last year.

American Cyanamid Company

First Quarter: Net profit of $1,675,602, after all charges, equal to 62 cents a share on 2,618,368 common shares after subtracting dividends on the preferred stock. This compares with $1,040,478, or 39 cents a share, in the first quarter of last year. The net profit does not include the equity in the undistributed net income of associated companies, 50 per cent owned or less.

Monsanto Chemical Company

First Quarter: Net operating income, after all charges, of $1,642,037, eliminating the accounts of the company's British subsidiary because of the uncertainties created by the war, equal to $1.23 a share on 1,241,695 shares outstanding after deductions for preferred dividend requirements and minority interest in an American subsidiary. This compares with $1,142,264, or 82 cents a share on 1,241,816 shares, for the corresponding period of 1939.

Thermoid Company

First Quarter: Net profit of $135,208, subject to audit, equal to 22 cents each on 476,388 shares of $1-par common stock after dividend requirements on 39,956 shares of $3 convertible preferred stock. This compares with $65,073, or 7 cents a share, in the corresponding quarter of 1939. For the twelve months ended March 31, 1940, Thermoid reports a net profit of $502,439, or 80 cents a common share.

American Zinc, Lead & Smelting

Year Ended March 31: Net profit of $354,463, equal to 2 cents each on 673,088 shares of common stock after providing dividend requirements on the $5 prior preferred and $6 preferred stocks outstanding. In the same period a year ago the company reported a net loss of $21,552. For the March quarter, profit amount to $79,600 as compared with $44,769 last year.

New Jersey Zinc Company

First Quarter: Net profit of $1,765,112, including $107,344 proceeds from patents, equal to 90 cents each on 1,963,264 capital shares, which compares with $1,076,266, including $162,913 proceeds from patents, or 55 cents a share, in the corresponding period last year.

O'Sullivan Rubber Company

For 1939: Net profit of $109,485, after all charges including Federal and state income taxes, which compares with $5,986 in the preceding year. Current assets as of December 31, 1939, amounted to $551,946 and current liabilities to $271,988.

General Cable Corporation

First Quarter: Net income of $727,425, equal to 32 cents each on 618,182 common shares outstanding after dividend requirements on preferred and Class A stocks. This contrasts with a loss of $196,773 reported for the first quarter of 1939.

Lee Rubber & Tire Corp.

Six Months to April 30: Net earnings are estimated at $1.60 to $1.70 per share on the outstanding stock, according to A. A. Garthwaite, president. This compares with a payment of $2.55 a share for the same period of the previous year.

Anaconda Wire & Cable Co.

First Quarter: Preliminary report shows a net profit of $129,280, equal to 31 cents each on 421,981 common shares, which contrasts with a loss of $77,161 reported for the first quarter of the preceding year.

Converse Rubber Company

Year Ended January 27: Net profit of $2,775, equal to 16 cents each on 17,742 shares of $2 preferred stock, which compares with $11,074, or 62 cents a share on this stock, in the period from April 2, 1938, to January 28, 1939.

Hewitt Rubber Corporation

First Quarter: Net profit of $38,377, after all charges, equal to 23 cents a share, which compares with $41,573, or 25 cents a share, reported for the first quarter of the previous year.

Form Tensolite Corporation

H. D. Minich, inventor of Tensolite, the tensilized form of Pliofilm, has organized the Tensolite Corporation, with headquarters at North Tarrytown, N. Y., for the manufacture of cords, ribbons, yarns and other types of Tensolite products. According to the contract which exists between Mr. Minich and the Goodyear Tire & Rubber Co., manufacturers of Pliofilm, the former is permitted to manufacture various products from the tensilized rubber hydrochloride. These rights have been transferred to the new corporation. (For a complete description of Tensolite, see RUBBER AGE, December, 1939.)

Rubber Associates Moves

Offices of Rubber Associates, Inc., manufacturers of latex expansion joints for roads and highways, have been moved from 1790 Broadway to 1230 Sixth Avenue, the new U. S. Rubber Building, in New York City. S. P. Tauber is president and general manager of the company.

NAMES IN THE NEWS

BAYNARD R. WHALEY, formerly associated with the Firestone Rubber & Latex Products Co., Fall River, Mass., has joined the research and development staff of the Sonoco Products Co., Hartsville, S. C.

J. C. GIBSON, president, Pioneer Rubber Co., Willard, Ohio, was chairman of a session on foreign relations held during the Annual Conference of Ohio Rotary Clubs, held in Lima, Ohio, the week of April 22.

DR. GUSTAVE EGLOFF, director of research, Universal Oil Products Co., Chicago, has been awarded the medal of the American Institute of Chemists. The medal, presented annually for outstanding service to the science of chemistry, will be presented to DR. EGLOFF at the annual meeting of the Institute to be held in Atlantic City, N. J., on May 18.

CLARENCE E. MCCORMICK, chief engineer, Republic Rubber Co., Youngstown, Ohio, discussed "Patents" at a meeting of the Hubbard (Ohio) Kiwanis Club, held in Hubbard on April 24. MR. MCCORMICK has made a hobby of collecting specifications of unusual and amusing patents.

WILLIAM M. O'NEIL, son of the president of the General Tire & Rubber Co., Akron, has secured control of Radio Station WJW in Akron. The Federal Communications Commission approved the deal which gave him stock control.

C. E. JONES, comptroller, Seiberling Rubber Co., Akron, will lead a round-table discussion on "The Limits of a Cost Accountant's Duties" at the meeting of the Akron Chapter of the National Association of Cost Accountants, scheduled for May 21.

A. SCHULMAN, president of the crude and scrap rubber firm bearing his name in Akron, Ohio, has been added to the Executive Committee of the Scrap Rubber Institute of the National Association of Waste Material Dealers.

DR. HOWARD E. FRITZ, manager, synthetics division, B. F. Goodrich Co., Akron, gave an address and a demonstration of Koroseal before the Springfield (Ohio) Engineers Club at a meeting of the club held in Springfield on April 18.

ALLEN N. BENNETT, of Framingham, Mass., has been elected president of the Graton & Knight Co., Worcester, Mass., succeeding FREDERICK E. BARTH, resigned. MR. BENNETT is also vice-president of Barrett & Co., Inc., leather manufacturers of Newark, N. J.

ARTHUR NOLAN, assistant to the sales manager for latex and dispersions, Naugatuck Chemical Division, U. S. Rubber Co., 1230 Sixth Ave., New York, is back on the job following an appendectomy last month.

R. W. BROWN, Firestone Tire & Rubber Co., will deliver a paper on "Engineering Properties of Rubber in Compression" at the 35th Anniversary Summer Meeting of the Society of Automotive Engineers, to be held in White Sulphur Springs, June 9-14.

A. G. CAMERON, vice-president and general manager of Goodyear Tire & Rubber Export Co., has been elected to the board of directors of the parent company, succeeding GEORGE T. BISHOP, resigned. MR. CAMERON has been with Goodyear for the past 27 years.

H. H. WATERS, chief engineer, Firestone Tire & Rubber Co., has been named a member of the newly-created Water Table Committee of the Ohio Chamber of Commerce. The committee is concerned with water supply and restoration of ground waters.

J. R. KEACH, purchasing agent, Ohio Rubber Co., Willoughby, Ohio, was elected president of the Cleveland Purchasing Agents Association at a meeting of the Association held in Cleveland on April 19.

DR. J. A. BATA, president, Bata Shoe Co., Inc., Belcamp, Maryland, has been elected a governor of the Pan-American Trade Committee. He is currently on an extensive trip through South America.

WILLIAM I. O'BRYAN, secretary-treasurer, Pharis Tire & Rubber Co., Newark, Ohio, was elected president of the Newark Rotary Club at a meeting held on April 16. He previously had been a vice-president.

EDWIN T. ASPLUNDH has been elected a vice-president of the Pittsburgh Plate Glass Company and vice-president and general manager of the Columbia Chemical Division of that company. He succeeds HUGH A. GALT, retired.

F. E. TRAFLET, formerly assistant secretary of the Pequanoc Rubber Co., Butler, N. J., was recently elected a vice-president of that concern.

GEORGE FREESE, previously chief chemist of the Lawrenceville Plant of the Pioneer Asphalt Co., has been appointed a full time technical consultant of that company. He will make his headquarters at the new Chicago plant.

World's Longest Conveyor Belt

Operation of the world's longest conveyor belt, manufactured by the Goodyear Tire & Rubber Co., Akron, for the Columbia Construction Co., Inc., to carry aggregate from gravel pits at Redding, California, to the Shasta Dam at Coram, a distance of 9.6 miles, began last month. Twice as long as the largest previously built, the belt system operates at a speed of 550 feet per minute. It has a capacity load of 1,100 tons an hour. The belt is 36 inches wide, weighs approximately 1,500,000 pounds, and will carry 10,000,000 tons of aggregate for the dam in a four-year period.

Admiar Rubber Changes Name

The Admiar Rubber Co., of 273 Van Sinderen Avenue, Brooklyn, N. Y., rubber division of the Ideal Novelty & Toy Co., has changed its name to the Ideal Rubber Co. The change was made in keeping with a new policy to have the names of all subsidiaries harmonize with that of the parent company. Ideal Rubber will operate under the same management as heretofore, with Maurice I. Sanders as factory manager and Guy B. Wyatt as technical superintendent. Considerable new machinery and equipment is being installed at the rubber plant to enable the company to branch out into new fields of rubber manufacture.

FRANK J. REES, sales promotion manager, tire division, B. F. Goodrich Co., will act as resident manager of the company's exhibit at the New York World's Fair this year. GUY GUNDAKER, JR., resident manager of the exhibit last year, will serve as non-resident manager and will be located at the exhibit for the first few weeks only.

A. L. MATELIK, who has been associated with the Franklin Rubber and the Quaker City Rubber companies, has joined the Martin Rubber Co., Inc., Long Branch, N. J., as general plant superintendent.

LOS ANGELES NEWS

The Typrene Roller Company has been established at 5811 Wilmington Avenue by Clark L. Tyler, former employee of the Rubbercraft Corporation of California. The new company manufactures rollers for industrial uses, particularly rollers for printing and offsetting. John F. Torrey, a well known rubber salesman in Los Angeles, has been named sales manager. Mr. Tyler has developed his own formulas through years of experience. Rollers are being made from neoprene and other synthetics as well as from rubber. In addition to his service with Rubbercraft, Mr. Tyler for four years was superintendent of the plant of the Universal Rubber Company at San Francisco.

The Golden State Rubber Mills has installed an attractive bronze sign above the main entrance to its factory, one of the finest of its kind on the street where the factory is located.

"Vitacap" is the name of a new process of tire re-capping perfected by A. B. Cleveland and associates in the American Tire Machinery Company, 810 East 61st Street. Mr. Cleveland states that this process enables a workman to re-cap a greater number of tires in a given time. Fundamentally, the equipment consists of two units—the power stitcher and the curing chamber. The former is used to apply the camelback to the casing under immense pressure. The latter has as its central principle the application of live steam at a pressure of 40 pounds per square inch under a temperature of 219° F., a principle that the manufacturer contends tends to restore the moisture content of the casing and to re-vitalize it.

Dick Newell, who has been plant superintendent for the Rubbercraft Corporation of California for some years, has resigned to become control engineer for Western Insulated Wire, Inc. Mr. Newell has been succeeded at Rubbercraft by W. E. Shawger, formerly connected with the D and M Machine Works, Compton, California.

The Faulhaber Rubber Company, 1346 East Slauson Avenue, celebrated its fourth anniversary in business on Saturday, May 4. Employees and their families were entertained and about 250 people dropped in to offer congratulations. The company, which manufactures floor coverings, has had a rapid growth since its organization.

E. F. McClung, proprietor of Royal Auto Products, 2106 Walter Street, spent most of the month in Kansas City on business. This company manufactures floor mats from truck tire casings and has achieved a near-national distribution.

William C. Holmes, local manager for the Dill Manufacturing Company and chairman of the Los Angeles Rubber Group, spent a portion of the month in the Pacific Northwest on business.

H. W. Rumsfeld, plant superintendent for the Western Shade Cloth Company, Chicago, spent several days in the Los Angeles area this month. He was giving particular attention to the interests of Holland cloth which is distributed here through H. M. Royal, Inc. This was Mr. Rumsfeld's first visit to the Los Angeles area.

Goodrich is building a fine new retail store at Alameda and Sixteenth Streets, Los Angeles. The structure will be of reinforced brick construction and will be completed about the middle of July. The store will be one of the model stores of the kind in this part of the United States.

The job of re-painting the interior of the Goodrich factory with aluminum paint to give it brightness has been completed. Installation of new machinery in connection with general modernization is being pushed as rapidly as possible.

H. O. Keefer who has served in responsible positions for several Los Angeles rubber goods manufacturers is the new plant superintendent for the Santa Fe Rubber Mills, 609 Santa Fe Avenue.

Vic Vodra of the Sierra Rubber Company, 2472 East 8th Street, has been named Pacific Coast sales representative for the R. T. Vanderbilt Company and was scheduled to go east the middle of May for a course of training in the home offices and plants. On his return Mr. Vodra will have his headquarters in Los Angeles and continue to have his home here.

OBITUARIES

Loren C. Rockhill

Loren Curtis Rockhill, who served as sales manager for the Goodyear Tire & Rubber Company from 1919 to 1928, and several years thereafter as vice-president in charge of sales for the old Miller Rubber Company, died on April 22 in City Hospital, Akron, Ohio, from bronchial pneumonia, at the age of 55.

Mr. Rockhill was born and received his education in Canton, Ohio. During his high school days he worked as a distributing agent for the Cleveland *Press* and after entering Mount Union College became that paper's correspondent in Alliance, Ohio, also serving as a reporter for an Alliance newspaper. Upon being graduated in 1906 he immediately entered the advertising department of the Cleveland paper.

In 1908, Mr. Rockhill joined Goodyear, serving successively as manager of the factory repair department, assistant manager of the automobile tire department, manager of the aeronautics department, manager of the automobile tire department, manager of the merchandising department, and finally sales manager. He resigned from Goodyear in 1928 to become a vice-president of Miller Rubber and also served as a director of that company. Since retiring from active participation in the rubber industry he had devoted his time to extensive farming near Hartville, Ohio.

Dudley D. Roberts

Dudley D. Roberts, president, Rubatex Products, Inc., 420 Lexington Avenue, New York City, holder of the Rubatex patents in the United States, died recently of a cerebral hemorrhage. Born in 1874, in Newark, N. J., Dr. Roberts was graduated from Columbia University in 1898, and practiced medicine until 1930 when he turned his attention to finance and to work on patents, inventions and projects. He served during the World War as a major in the Army Medical Corps. Dr. Roberts was a member of the Racquet & Tennis, Garden City Golf, Maidstone, Grolier and Everglades clubs. He left a widow, two sons and two daughters.

Herman Lehn

Herman Lehn, production manager of the Kerite Insulated Wire & Cable Co., of New York and Seymour, Conn., died at the Le Roy Sanitarium, in New York City, of a streptococcus infection, after an illness of two months, on April 20. He was 56 years of age. He leaves a widow and twin daughters.

As we go to press we learn of the sudden passing of Edward A. Pope, vice-president of the Cleveland Liner & Manufacturing Co. An obituary will appear next month.

CANADIAN NEWS

Canada Wire and Cable Co., Ltd., Leaside, Ontario, in anticipation of a successful year, is spending $10,000 in building an extension to its rubber plant to house additional equipment. H. Horsfall, president, recently stated: "The ascending spiral of provincial profit taxes constitutes a very serious threat to business initiative. Although the war has introduced many new factors into the situation we feel we may look forward to securing a fair share of the emergency business now offering and with a prospect of a continuation of a good volume of our normal business the outlook for 1940 is considered satisfactory". The company was recently awarded a $38,089 contract by the War Supply Board, Ottawa.

R. C. Berkinshaw, treasurer and general manager of the Goodyear Tire and Rubber Company of Canada, Ltd., and president of the Toronto Board of Trade, was elected recently to the Board of Directors Representing Industry of the Canadian National Exhibition Association.

Betterment in sales, earnings and working capital is reported by the Dominion Rubber Company, Ltd., for the year ended December 31, 1939. Net sales amounted to $12,729,682, an increase of $1,083,000 over the previous year. Although an operating profit of $589,301 was reported, a net loss of $163,728 was incurred on the year's operations after provision for depreciation and other charges. Net loss for the previous year was $528,458.

The balance sheet shows current assets of $5,657,989 against liabilities of $1,150,881 or a net working capital of $4,507,108 compared with $3,497,304 at the end of 1938. Foreign exchange since the outbreak of the present war has cost the company $97,058, Paul C. Jones, president, states in his annual report.

Canadian Consolidated Felt Company, controlled by Dominion Rubber, reports for the year ended December 31, 1939, a loss of $4,042 after depreciation and interest, compared with a loss of $29,423 for the previous year. Net sales of $447,237 were reported, an increase of $94,000.

Canada's crude rubber imports during February totaled 7,515,159 pounds against 11,259,546 in January and 3,250,104 in February of 1939, reports the Dominion Bureau of Statistics. February rubber imports from the Straits Settlements amounted to 6,621,760. Total rubber imports were valued at $1,983,158 compared with $2,630,572 for January and $736,066 for February, 1939.

Shareholders of the Canadian Consolidated Felt Co., Ltd., Kitchener, are now considering an offer made by the Dominion Rubber Company, Ltd., to purchase the assets and liabilities of the company. They have been asked to approve a resolution passed by their directors on April 23 accepting Dominion's offer of $50,000 cash, discharge of the felt company from its indebtedness to Dominion Rubber of $198,000, and assumption by the purchaser of all assets and liabilities including the organization's obligations under employees' pension and savings plans.

Consolidated Felt has not paid a dividend on its seven per cent preference shares since June 30, 1930, and arrears now total $163.50 a share. No sales of the preferred stock have been recorded since 1930. Majority of the common stock is owned by Dominion Rubber. On December 31, 1939, current liabilities exceeded current assets by $83,843. The preferred shares have an equity based on total assets less patents, good will and current liabilities of $9.88 a share. There are at present 5,000 shares of preferred outstanding and if the Dominion offer is accepted this means a disbursement of $10 a share on the $100 par value stock. The company retired its funded debt on April 1 consisting of $105,500 six per cent first mortgage bonds. Sufficient funds were on deposit with the trustee for the bondholders to effect this retirement.

Very recently, C. C. Thackray, former vice-president of Consolidated Felt, was elected president succeeding Paul C. Jones, president of Dominion Rubber, who continues as a director. At the same time, M. O. Simpson, comptroller of Dominion Rubber, was elected a director to replace A. Whitehouse on the Consolidated Felt board.

Controller of Canadian Dunlop

W. Hugh Flynn (above), who has been associated with the accounting and sales divisions of the Dunlop Tire & Rubber Goods Co., Ltd., of Toronto, Ontario, for the past several years, has been appointed controller of that company.

A. G. Partridge, president of Canadian Goodyear, is one of seven prominent Toronto businessmen who have formed an unusual organization which is to be known as "Ten A Year, Ltd." Purpose of the organization is to aid University of Toronto science graduates to get jobs. Each year, ten members of the fourth year chemical engineering class recommended by the faculty, will be selected as shareholders in the new company. The directors are responsible for placing the ten shareholders in commercial or professional positions. When placed, the ten shareholders will in turn act as outposts to inform the directors of other openings available for the next ten students to be selected.

Clarence A. Leicht, chief engineer and assistant factory manager of Canadian Goodrich, was elected vice-chairman of the Leather, Rubber and Tanners' Division of the Industrial Accident Prevention Association at the group's silver jubilee convention held recently in Toronto.

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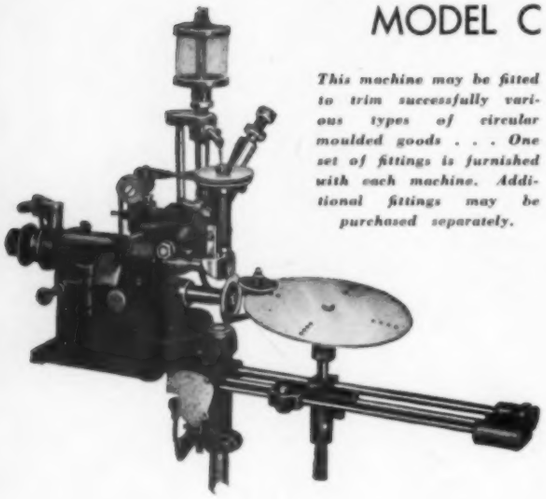

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Johnson City, N. Y.
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Lynn, Mass.....525 Union
Milwaukee, Wis..522 N. Fourth
New York, N. Y. 110 Fifth Ave.
Philadelphia, Pa. 221 No. 13th
Rochester, N. Y.....130 Mill
St. Louis, Mo.....1423 Olive
San Francisco, Cal..859 Mission
Worcester, Mass...71 Mechanic

NEW EQUIPMENT

Miami Power-Driven Dip Machine

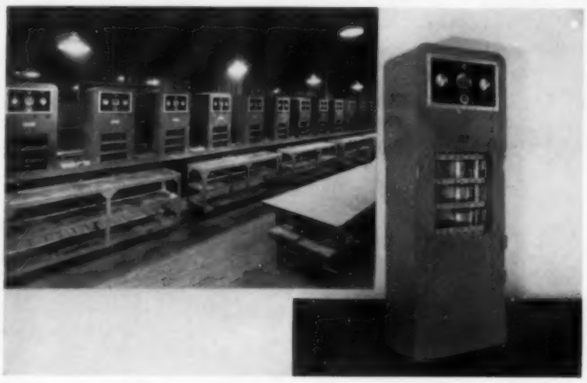
Power-driven dip machines, recommended for intricate dipping, such as in the case of electricians' gloves, or wherever precision dipping is required, are

specialties of the Miami Boiler & Machine Co., Akron, Ohio. The small power-driven dip machine illustrated herewith has a tank 14 inches wide, 36 inches long, and 14 inches deep, but larger dip machines accommodate any number of dip tanks up to nine or a single dip tank 40 inches wide by 110 inches long. The circulating tank on these machines can be minutely adjusted to circulate latex of various viscosities. The machines have a minimum speed of immersion or withdrawal of 2 inches per minute which can be increased at will by tightening a thumb-screw under the long lever. Speeds up to 55 inches per minute can be obtained. The dip machines are equipped with a limit switch which automatically stops the carriage when it has reached the top, and another adjustable switch which can be set to stop the carriage on its descent any distance from the tank. They are also equipped with magnetic brake to minimize drifting. Hand-operated dip machines are also made by the company, one of which is illustrated elsewhere in this issue in connection with Part III of Dr. R. J. Noble's series of articles on "Advances in Latex Technology."

Streamlined Hydraulic Presses

Streamlined hydraulic presses for the molding of small rubber and plastic articles, 20 by 20 inches in size, have been introduced by the Farrel-Birmingham Co., Inc., Ansonia, Conn. Streamlining not only provides for improved appearance, but facilitates keeping the presses clean and the floor area orderly. The housing on the new press, which includes the top, bottom

and sides, is a single casting, with a cylinder of Meehanite set in the base. Cylinder and gland are lined with bronze and the gland studs and nuts are of stainless steel, these features preventing corrosion. The press is designed to operate at an initial water pressure of 2,000 pounds per square inch, giving a total



pressure of 113 tons or 563 pounds per square inch on the platens. It is equipped with three 2-inch square plates, of rolled steel, machined to provide a smooth finish and drilled to permit maximum steam circulation and uniform heating. Temperature of the platens is automatically controlled by an air-operated diaphragm valve, located in an opening at the top of the press. Temperature of the platens, steam, air and water pressure are all indicated by gauges mounted in a panel on the front of the press, visible to the operator at all times. The accompanying illustration shows a battery of twelve of the new presses and a close-up of one.

Improved Federal Comparator

A number of improvements have been made to the Model N Comparator, an instrument which is practical for setting and checking other gages to be used in production inspection, by its manufacturer, the Federal Products Corp., Providence, R. I. The base has been

entirely redesigned so that it is now supported on three feet instead of four assuring a positive footing wherever the gage may be placed. The supporting column is heavier and the regular supporting bracket holds the

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No. 3-B

Height .....9" Length .....9¾" Range .....½"
Depth of Throat ....6½" Dial 50 Divisions Each Div. 1/1000" Weight .... 4 lbs. Frame . Aluminum

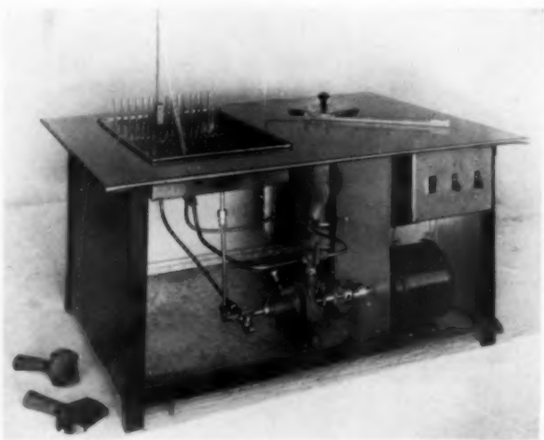
Designed for gauging stock as it is coming from the calender.

FRANK E. RANDALL, Waltham, Mass.

indicator by the back instead of by the stem, thus avoiding the liability of binding the rack spindle. Holes are provided in the base through which an angle attachment can be fitted for holding cylindrical work or to act as a stop for work placed on the platen. A special attachment, called the AN-4, can be furnished with the improved instrument to take the place of the regular supporting bracket. The attachment provides a fine setting for the indicator by means of a thumb screw located just in front of the post, and allows adjustment of ten to twenty thousandths. The regular indicator furnished is graduated in .0001-inch, but other indicators can be substituted if desired. The new Model N Comparator can also be used directly in production and inspection, and is said to be a quick and accurate gage for checking pistons, valve stems, bolts, flat stock, bushings, and hundreds of other parts.

Naugatuck T-50 Apparatus

The T-50 test apparatus, which provides a quick, accurate and convenient method of determining state of cure, originally developed by the Naugatuck Chemical Division of the United States Rubber Company, is now available from the Henry L. Scott Co., Providence, R. I. The test method is to stretch specimens on the racks to designated elongation (over 50% of



elongation at break) and to immerse the racks with specimens in place in a tank containing fluid, cooled to —50° to —60° C. After one minute the slide clamp at one end is released, a three-way valve is turned to the indicated position, a heater switch is turned to the "on" position, and the liquid slowly warmed. The specimens react at different temperatures according to the state of cure and the temperature at which the sample has retracted to 50% of the original elongated length is read as the T-50. The T-50 apparatus consists of a cabinet, tank, cooling unit, heating unit, specimen holders, motor and pump, all of which may be seen in the accompanying illustration. In size, it is 28 inches long, 21 inches wide and 13 inches high. Its net weight is 125 pounds. The capacity of the circulating system is approximately 2 quarts. Acetone is generally used as the fluid, since it has proved to be economical, safe and clean. Other liquids of similar characteristics, however, can also be used.

Self-Contained Hot Plate Press

The Baldwin-Southwark Division of the Baldwin Locomotive Works, Philadelphia, Penna., is offering a new self-contained hot plate press for laboratory or production work. It has a capacity of 115 tons, 24 by

24-inch platens, and a 6-inch stroke. A conveniently located work table and single handwheel control are designed to minimize mold handling, thus reducing operator fatigue. A saving in power costs is said to be secured because the two-pressure pump, driven by a 3 h.p. motor, need not run continuously to maintain a predetermined pressure on long cures. Positive platen alignment and minimum radiant heat losses are assured by means of side slab construction, according to the manufacturer. Pressure may be quickly adjusted from the front of the unit over a wide range up to 1,150 pounds per square inch. The new press may be equipped with either steam-heated or electrically-heated platens.

BRIEFS . . . . .

The production of a less expensive **Portable Beckman pH Meter,** using the quinhydrone electrode, which is said to be better suited to many plant control measurements than previous models, has been announced by the Central Scientific Co., 1700 Irving Park Road, Chicago, Ill.

Developed for applications where occasional prints are required, the **Elpro Portable Printer** has been introduced by the Ozalid Corp., Johnson City, N. Y. It will make positive type reproductions in sizes up to 12 x 18 inches of engineering drawings, maps, letters, or any pencil or ink lines, typewritten or printed matter appearing on one side of a reasonably translucent material.

H. O. Bates, 251 N. Broad St., Elizabeth, N. J., has developed a **Golf Ball Marker** which operates like a pair of pliers. It is furnished with a full set of numbers and is intended to identify golf balls by number or letter.

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REVIEWS

BOOKS

Plastics in Engineering. By J. Delmonte. Published by Penton Publishing Co., Penton Building, Cleveland, Ohio. 6 x 9¼ in. 465 pp. $7.50.

Although primarily prepared for the growing ranks of designers treating with plastic materials, this book is an excellent treatise on the progress and extent of applications of plastics. Advantages and disadvantages of the various plastics are discussed without bias in terms of engineering problems. The technical data is conveniently tabulated and classified for easy reference. Analysis of some important engineering properties of plastics also is made in terms of the fundamental nature of the materials and correlated phenomena such as condensation and polymerization.

In addition to the survey of engineering features, several of the 26 chapters are devoted to the chemistry of plastics and to the art of molding them. The chemical background of the sundry plastics, so essential to the correct scientific analysis of problems arising in the molding of materials and their behavior in service, is clearly given. A comprehensive analysis of molding problems and mold designs is included. The laminating, casting and extruding of organic plastics are also discussed.

Although few designers or engineers consider the so-called synthetic rubbers in terms of plastic materials, the author disagrees. Accordingly, he devotes one chapter to "Synthetic Rubbers and Rubber-Like Resins," wherein he discusses the chemical nature of the Bunas, neoprene and "Thiokol," tells of their development, gives some data on compounding, compares their properties, and finally reviews a number of their current engineering applications. Because of the growing interest in both thermoplastic and thermosetting plastic materials on the part of rubber manufacturers, this book is recommended for an initial understanding of these materials.

•

Proceedings of the 42nd Annual Meeting. (Vol. 39). Published by the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Penna. 6 x 9 in. 1350 pp. $8.50, heavy paper binding; $9.00, cloth; $10.00, half-leather.

This is the first time that the A.S.T.M.'s "Proceedings" have been issued in one volume. It covers not only all of the committee reports made at the annual meeting, held in Atlantic City, June 26-30, 1939, but also all of the technical papers delivered at that meeting. The committee reports not only give full details of the important recommendations on specifications and standardized test methods for materials, but in many cases include important data and information in the form of appended section reports or papers. The report of Committee D-11 on Rubber Products, and the several papers presented at the meeting of that committee at Atlantic City last year, are of course included in the book. The Fourteenth Edgar Marburg Lecture on "Stress, Strain and Structural Damage," by Professor H. F. Moore, precedes the technical paper section of the book.

•

Commodities in Industry. Prepared and published by the Commodity Research Bureau, Inc., 82 Beaver St., New York City. 8½ x 11 in. 720 pp. $7.50.

Although bearing the title "Commodities in Industry," this is actually the 1940 Commodity Year Book, the second in the annual series of volumes announced by the Commodity Research Bureau last year. (For a review of the 1939 Commodity Year Book, the first in the series, see RUBBER AGE,

April, 1939). Like the first edition it is a capably compiled review of the commodity markets.

In addition to a discussion of the general commodity price level, from which the conclusion is drawn that a commodity price boom in the United States will be the inevitable result of the current European war, seventy-five basic commodities are individually analyzed. Charts and statistical tables support these studies, close observance of which reveal many striking similarities between price movements during the present war and the early stages of the World War.

The section devoted to "Rubber" is begun with a four-page article largely devoted to a description of manufacturing tires and tubes. Then follows a brief review of the stock situation during 1939, operation of the restriction scheme, price fluctuations, the reclaimed rubber market and the rubber-cotton barter between the United States and Great Britain. The balance of the section is devoted to statistical tables and charts.

•

The New International Year Book—1939. Edited by Charles Earle Funk. Published by Funk & Wagnalls Co., 354 Fourth Ave., New York City. 7 x 9¾ in. 822 pp. $6.25.

The developments in all major lines of human activity throughout the world during 1939 are incorporated in the latest edition of this valuable annual. Like previous editions it records the progress made in industry, education, public works, etc., in addition to giving the biographies of prominent people who died during the year, discussing changes in the political structure of various countries, and in general giving world events encyclopedic treatment.

As an indication, the subject of rubber, prepared by M. E. Lerner, Managing Editor, RUBBER AGE, embraces a discussion of major happenings in the industry during 1939, such as the development of the Ekko Process, expanded use of latex foamed sponge, application of the Cryo-Vac wraps, in addition to including a number of statistical tables on rubber stocks, consumption, imports, etc.

•

Felber's Tavern. By Mark L. Felber. Published by Danner Press, Inc., Akron, Ohio. 5¼ x 8 in. 246 pp. $2.00.

The author of this book, which depicts people, things and incidents of the horse and buggy days of the 1880's, has long been associated with the Public Relations Department of the Goodyear Tire & Rubber Company. As he states in his introduction, the book is intended to provide "enjoyment, interest and entertainment," an aim which is capably achieved.

"Felber's Tavern" solves none of the world's intricate problems. Built around the tavern founded and operated by the author's grandfather in a northeastern Nebraska village, it caricatures the people who comprised such villages—the precinct constable, the village barber, the politician, the drug store clerk, etc. In many ways, it is simply a well-told story about anybody's little home town a half century or more ago. The book accomplishes Mr. Felber's intention, since it is humorously written and immensely enjoyable.

•

Physical Constants of Hydrocarbons. Vol. II. By Gustave Egloff. Published by Reinhold Publishing Corp., 330 W. 42nd St., New York City. 6 x 9 in. 605 pp. $12.00.

Whereas the first volume of this work (reviewed in RUBBER AGE, April, 1939) dealt with the paraffins, olefins, acetylenes, and other aliphatic hydrocarbons, the current volume treats with cyclanes, cyclenes, cyclynes, and other alicyclic hydrocarbons. Like the first edition, it has an introduction which is devoted to the structure and the nomenclature of the hydrocarbons involved, together with a critical evaluation of the data and calculation of the most probable values. The balance of the book is devoted to tables giving the physical constants, melting point, boiling point, specific gravity and refractive index of each of the alicyclic hydrocarbons.

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REVIEWS (CONT'D)

BOOKLETS, CATALOGS, Etc.

Survey of American Listed Corporations. Vol. I. Securities and Exchange Commission, Washington, D. C. 8½ x 11 in. 292 pp.

Carrying out the policy of the Securities Exchange Act of 1934 that reliable information concerning corporations listed with the Securities and Exchange Commission be made readily available to the public, this volume consists of a number of reports which present information based on registration statements and annual reports filed with the Commission. One of these reports deals with tires and other rubber products.

The present study is also intended to continue the attempt made in the original series of reports (see review on "Selected Information on Manufacturers of Tires and Other Rubber Products" in the April, 1939, issue of RUBBER AGE) to bridge the gap between the valuable data available in the Commission's files and the many potential users to whom the data would otherwise remain relatively unavailable.

The data given is largely of a financial nature, covering the years of 1934 to 1938, with balances at the beginning of each year shown by company, total dividends paid by each, amounts of various adjustments, and similar breakdown figures.

•

Report on the Progress of the WPA Program. Work Projects Administration, Federal Works Agency, Washington, D. C. 8 x 10½ in. 185 pp.

The activities of the Works Progress Administration (since renamed the Work Projects Administration) up to the end of June 30, 1939, is reviewed in this report, with summaries of the project accomplishments and operations of the Administration given, as well as of the project employment provided and the expenditures made. In addition, provisions for continuing the program during the current fiscal year are outlined, illustrations of project activities in specific instances, such as the rehabilitation work done in New England after the September, 1938, hurricane, are given, and the several programs providing employment on Federal work and construction projects and public relief are discussed. The report discloses that there were 2,550,000 persons employed on WPA at the end of June 30, 1939, and as many as 3,360,000 at the peak of the fiscal year's activities.

•

1940 Directory of Michigan Manufacturers. Published by the Michigan Manufacturer and Financial Record, Transportation Building, Detroit, Mich. 5¾ x 8½ in. 520 pp.

The latest edition of this directory, the second published, lists more than 6,000 manufacturers engaged in business in Michigan. Like the first edition, it is divided into three sections, *i.e.*, an alphabetical list, a geographical section, and a products classification section, each distinguished by vari-colored paper. The Alphabetical Section shows names, addresses, products manufactured, executive personnel, capitalization and employment figures. The Geographical Section embraces 385 Michigan cities, with population figures shown. The Products Section contains over 1,350 different classifications. Rubber manufacturers are of course included.

•

Bakelite Materials for Rubber Plate Printing. Bakelite Corp., Bloomfield, N. J. 3¾ x 8½ in. 12 pp.

This booklet serves a dual purpose in that it stresses the advantages of rubber plate printing and outlines the various Bakelite materials available for the manufacture of rubber printing plates, including matrix sheet, matrix powder and fabric. One section is devoted to a description of manufacturing the rubber plates in two simple steps, *i.e.*, making the matrix and molding the plate.

1940 Index to A.S.T.M. Standards Including Tentative Standards. Published by the American Society for Testing Materials, 260 South Broad St., Philadelphia, Penna. 6 x 9 in. 152 pp. Free on request.

Of service to anyone wishing to ascertain whether the A.S.T.M. has issued standard specifications, test methods, or definitions covering a particular engineering material or subject, the latest edition of this Index gives information on the Society's 885 standards as of January 1, 1940. All items are listed under appropriate key-words according to the subjects they cover. As a convenience, a list is given of the specifications and tests in numerical sequence of their serial designations. The Index is especially of value in helping to locate the standards in the Society's volumes wherein they appear.

•

1940 South American Handbook. Published by Trade and Travel Publications, Ltd., 14 Leadenhall St., London, E.C. 3, England. Distributed by H. W. Wilson Co., 950 University Ave., New York City. 4½ x 6½ in. 708 pp. $1.00.

The latest edition of this valuable handbook, seventeenth in the series, has been completely revised and brought up-to-date. Miscellaneous information on the South American countries, as well as on Central America, Mexico and Cuba, is given, such as physiological features, rivers and mountains, populations, travel data, monetary approximations, metric weights and measures, and a glossary of Spanish and Portuguese terms. Like previous editions, it is intended for both the exporter and the traveller.

•

Neoprene Type GN. (Lab. Report No. 40-2). By N. L. Catton, D. F. Fraser and D. B. Forman. Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, 6⅛ x 9⅜ in. 40 pp.

The principles of plasticizing and compounding Neoprene Type GN, a new and improved type of neoprene which is supplied as small, tough, rod-shaped pieces which are not suitable for direct use but which must be plasticized, are discussed in this report. The plasticizing operations, it is pointed out, are relatively simple and are carried out on conventional mixing equipment prior to or in conjunction with the mixing and compounding operations.

•

Catalog of Rubber and Composition Machinery—1940. Stewart Bolling & Co., Inc., 3190 E. 65th St., Cleveland, Ohio. 8½ x 11 in. 52 pp.

The diversified line of new, renewed and rebuilt machinery for the rubber, plastics, compositions, paint and synthetic material industries marketed by the company is described and illustrated in this new catalog. The machinery depicted ranges from small laboratory mixers to giant hydraulic presses. The size, capacity and special features of each piece of equipment are given. This is the 15th catalog issued by the company.

•

Dependable Modern Treatments for Burns. Written and published by Harold Joe Davis, 3927 East Admiral Place, Tulsa, Oklahoma. 4 x 6¼ in. 10 pp. 50c.

Methods of applying immediate treatment to both minor and major burns, together with suggestions for further treatment, are contained in this pamphlet. Cleaning of burns, use of bandages, tannic acid treatment, and paraffin treatment are some of the subjects discussed. The author is a safety engineer.

•

Contra Costa County. Contra Costa County Development Association, 337 Tenth St., Richmond, Calif. 9½ x 11 in.

This pamphlet is a condensed presentation of facts about Contra Costa County, California, as a factory location. Data on geography, materials, markets, power, water, credit and taxes is given. Copies are available upon request.

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

Crude Rubber

STARTING from 18.81 on April 10, low for the period, the price of spot rubber on the Commodity Exchange advanced steadily in mid-April until it had gained more than one full cent, reaching 19.87 on April 19. The constant threat of the widening of the European theatre of war was primarily responsible for the steady increase. Lessening of the tension, plus the release of a vessel containing a large supply of rubber which had been held for several days at Bermuda, broke the price to 19.31 on April 22, but increased speculative interest on the Exchange brought it back into higher channels shortly thereafter. Due to increasing fears that the British were requisitioning a number of vessels which ordinarily carry rubber, and that shipping space for rubber would become more scarce, the price jumped to 20.12 on May 4. It increased still further today (May 9) to 20.63, high for the period and a new high for the year. Still higher prices are expected immediately. Quotations in the outside market, Exchange, London and Singapore, follow:

As of May 9

Plantations—

Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.20⅝
July	—	@	.20¼
October-December	—	@	.19½
No. 2	—	@	.20½
No. 3	—	@	.20⅜
No. 4	—	@	.20¼
Thin Latex Crepe	—	@	.20½
Thick Latex Crepe	—	@	.20½
Brown Crepe, No. 1	—	@	.19⅞
Brown Crepe, No. 2	—	@	.19¾
Amber Crepe, No. 2	—	@	.19⅞
Amber Crepe, No. 3	—	@	.19¾
Brown Crepe, Rolled	—	@	.15¾

Latex—

Normal, per lb., carload lots.	—	@	.25¼

Paras—

Up-River, fine	—	@	.18⅜
Acre Bolivian, fine	—	@	.18½

Balata

Brazilian block	—	@	.14

LONDON MARKET

Standard Smoked Sheets—Buyers—May 9			
July-September	—	@	11 11/16d
October-December	—	@	11 11/16d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—May 9			
July-September	—	@	10 3/32d
October-December	—	@	10d

Scrap Rubber

The scrap rubber business has held up well in recent weeks although an erratic tendency has been noted in the past few days due to conditions abroad. Slight advances in the prices for auto tire peeling and beadless tire grades have been made since our last report. Current quotations follow:

(Prices to Consumers)

Auto tire peelings	ton 21.00	@22.00	
Mixed auto	ton 13.50	@14.00	
Beadless tires	ton 17.00	@18.00	
Clean solid truck tires	ton 30.00	@32.50	
Boots and shoes	ton 21.00	@22.00	
Arctics, untrimmed	ton 14.00	@15.00	
Inner tubes, No. 1	lb. .10	@ .11	
Inner tubes, No. 2	lb. .04¼	@ .04⅜	
Inner tubes, Red	lb. .04⅜	@ .04½	

NEW YORK, MAY 9, 1940

Reclaimed Rubber

A slight pick-up in demand in the past month is reported by reclaimers, with a decided increase expected within the very near future based on the widening theatre of hostilities in Europe. Consumption of reclaim in March was estimated at 17,560 long tons, 3.1% above that for the previous month, by the Rubber Manufacturers Association. There has been no change in the price structure since our last report. Current quotations follow:

Shoe

Unwashed	lb. .06½	@	.06¾
Washed	lb. .10	@	.10¼

Tube

No. 2 (Compounded)	lb. .09	@	.10
Red Tube	lb. .09	@	.09¼

Tires

Black (acid process)	lb. .07	@	.07¼
Black, selected tires	lb. .06	@	.06¼
Dark Gray	lb. .09¼	@	.10
White	lb. .12½	@	.14
Truck, Heavy Gravity	lb. .05½	@	.06
Truck, Light Gravity	lb. .07	@	.07½

Miscellaneous

Mechanical blends	lb. .04½	@	.05

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb. .31	@	.31¼
Peeler, carded, 23/4/3	lb. .32	@	.32¼
Peeler, carded, 15/3/3	lb. .29	@	.29¼
Peeler, carded, 15/4/2	lb. .29	@	.29¼
Peeler, carded, 13/3/3	lb. .28	@	.28¼
CHAFERS			
Carded, American, 1 1/16"	lb. .31¼	@	.31¾
Carded, American, 1"	lb. .21½	@	.27

Cotton

The price of middling uplands on the Exchange has swung in a narrow 30-point range since our last report, high for the period being 10.99 on April 23 and low 10.69 on May 7. The weather was the dominant factor in quotations during April, the price rising slowly on recurring reports of intensive rain in Texas, Oklahoma and Arkansas, and a cold wave in the south. More favorable weather conditions, plus an unusually large amount of foreign selling, caused prices to sag during the current month, although better domestic mill buying in the last day or two gives indication of bringing the price up into higher channels. According to latest estimates, a smaller intended acreage will be put under cultivation this spring, the present indicated acreage being 24,647,000 acres as compared with previous estimates of 24,814,000 acres, a reduction of 167,000 acres. Quotations for middling uplands on the Exchange follow:

	Apr. 9*	May 9*		
	Close	High	Low	Close
July	10.63	10.46	10.39	10.45
October	9.98	9.95	9.85	9.92
December	9.84	9.85	9.85	9.85

(*) New Contract.

Sheetings

48x40	36 in.	5.50	lb.	— @	.04
40x40	36 in.	6.15	lb.	— @	.03½
40x36	36 in.	6.50	lb.	— @	.03⅜
48x48	40 in.	2.50	lb.	— @	.08¾
48x48	40 in.	2.85	lb.	— @	.07¾
56x60	40 in.	3.60	lb.	— @	.07
48x44	40 in.	3.75	lb.	— @	.05⅝

Ducks

Enameling (single filling)	lb. .24½	@	.28½
Belting and Hose	lb. .26¼	@	—
Single filling, A grade	lb. .10¾	@	.11¾
Double filling	lb. .11¾	@	.12¾

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 Tons

FROM APRIL 10 TO MAY 9

Date		Spot	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Sales
Apr.	10	18.81	18.76	18.66	18.46	18.25	18.14	18.01	17.97	17.92	17.86	17.84	17.82	17.80	——	171
	11	18.85	18.82	18.72	18.46	18.20	18.10	18.00	17.87	17.83	17.80	17.78	17.76	17.74	——	132
	12	18.85	18.70	18.60	18.33	18.05	17.92	17.80	17.67	17.63	17.60	17.58	17.56	17.54	——	200
	13	18.81	18.75	18.65	18.36	18.07	18.00	17.85	17.73	17.69	17.66	17.58	17.56	17.54	——	49
	14															
	15	18.94	18.92	18.82	18.53	18.24	18.12	18.00	17.83	17.78	17.75	17.71	17.67	17.63	——	111
	16	19.38	19.30	19.20	18.90	18.58	18.43	18.27	18.09	18.05	18.02	17.98	17.94	17.90	——	284
	17	19.67	19.60	19.50	19.10	18.70	18.56	18.43	18.23	18.20	18.18	18.13	18.08	18.03	——	347
	18	19.81	19.73	19.63	19.21	18.80	18.66	18.53	18.38	18.35	18.31	18.27	18.21	18.15	——	415
	19	19.87	19.77	19.67	19.33	19.00	18.83	18.67	18.52	18.49	18.47	18.42	18.37	18.32	——	359
	20	19.87	19.68	19.58	19.33	19.08	18.90	18.72	18.57	18.53	18.50	18.44	18.38	18.32	——	124
	21															
	22	19.31	19.18	19.08	18.88	18.68	18.56	18.45	18.23	18.19	18.15	18.10	18.05	18.00	——	300
	23	19.35	19.19	19.08	18.92	18.75	18.61	18.48	18.29	18.25	18.22	18.16	18.10	18.04	——	115
	24	19.43	19.25	19.15	18.97	18.82	18.67	18.51	18.37	18.33	18.30	18.24	18.18	18.13	——	105
	25	19.75	19.61	19.51	19.28	19.06	18.87	18.69	18.60	18.54	18.48	18.42	18.36	18.30	——	132
	26	19.68	——	19.38	19.18	18.95	18.82	18.69	18.57	18.53	18.50	18.44	18.38	18.32	——	153
	27	19.50	——	19.24	19.05	18.85	18.73	18.62	18.47	18.43	18.40	18.35	18.30	18.25	——	83
	28															
	29	19.50	——	19.25	19.06	18.87	18.77	18.67	18.51	18.48	18.45	18.40	18.34	18.29	——	205
	30	19.25	——	18.97	18.81	18.65	18.51	18.35	18.21	18.18	18.15	18.10	18.05	18.00	——	209
May	1	19.25	——	19.00	18.83	18.66	18.52	18.37	18.21	18.18	18.15	18.10	18.05	18.00	18.00	66
	2	19.45	——	19.20	19.03	18.87	18.71	18.55	18.40	18.36	18.33	18.28	18.23	18.18	18.18	104
	3	19.95	——	19.79	19.69	19.59	19.36	19.14	18.90	18.85	18.80	18.73	18.68	18.63	18.63	527
	4	20.12	——	19.90	19.81	19.72	19.47	19.22	18.97	18.92	18.87	18.84	18.77	18.70	18.70	191
	5															
	6	20.00	——	19.80	19.70	19.60	19.33	19.07	18.86	18.82	18.79	18.74	18.68	18.62	18.62	140
	7	20.13	——	19.92	19.82	19.72	19.47	19.22	18.99	18.95	18.91	18.86	18.81	18.76	18.76	183
	8	20.50	——	20.35	20.15	19.95	19.70	19.45	19.15	19.10	19.05	19.04	18.90	18.85	18.85	260
	9	20.63	——	20.42	20.31	20.11	19.79	19.47	19.22	19.17	19.12	19.05	18.99	18.93	18.93	269

CHEMICAL MARKETS

New York, May 10, 1940
All Prices F.O.B. Works

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.24 @	.30
A-10	lb.	.31 @	.35
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.65
Butyl Zimate	lb.	2.50 @	—
Captax	lb.	.50 @	.57
Crylene	lb.	.55 @	.65
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.36
El-Sixty	lb.	.50 @	.65
Ethyl Zimate	lb.	2.50 @	—
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.40 @	.50
Hepteen	lb.	.35 @	.40
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.14 @	—
Witco		.15 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	— @	2.35
Oxynone	lb.	.64 @	.80
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	2.50 @	—
Pipsolene	lb.	1.55 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	2.50 @	2.75
R-33	lb.	.40 @	—
RN-2	lb.	1.40 @	1.80
RN-2 Crystals	lb.	2.00 @	2.25
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.30
SPDX	lb.	.70 @	.75
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.18 @	.25
Thiocarbanilid, drums	lb.	.24 @	.30
Thiurad	lb.	— @	2.35
Trimene	lb.	.55 @	.65
base	lb.	1.05 @	1.20
Triphenylguanidine	lb.	.45 @	—
Tuads	lb.	2.35 @	—
Ulto	lb.	1.50 @	1.75
Ureka	lb.	.60 @	.75
Ureka Blend B	lb.	.60 @	.75
Ureka C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—
Zimate	lb.	2.35 @	—
Inorganic			
Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)

Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Guignet's Green	lb.	.70 @	—
Reds			
Antimony			
crimson, 15/17	lb.	.45 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone, No. 19	lb.	.05¼ @	.05½
Cryptone CB, No. 21	lb.	.05¼ @	.05½
Cryptone, ZS-230	lb.	.07½ @	.07¾
Cryptone, ZS-86	lb.	.07½ @	.07¾
Lithopone			
Albalith, black label—11	lb.	.03¼ @	.04
Azolith	lb.	.03¼ @	.04
Ray-bar	lb.	.05¼ @	.05¾
Ray-cal	lb.	.05¼ @	.05¾
Rayox	lb.	.13 @	.14
Titanox A	lb.	.13 @	.14
Titanox B	lb.	.05¼ @	.05¾
Titanox C	lb.	.05 @	.05½
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06¼ @	.06½
Anaconda, lead free	lb.	.06¾ @	.06½
Horsehead Lead Free Brand:			
Special—3	lb.	.06¼ @	.06½
XX Red—4	lb.	.06¼ @	.06½
XX Red—72	lb.	.06¼ @	.06½
XX Red—78	lb.	.06¼ @	.06½
XX Red—103	lb.	.06¼ @	.06½
Kadox, black label—15	lb.	.06½ @	.06¾
Blue label—16	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06¼ @	.06½
green label	lb.	.06¼ @	.06½
red label	lb.	.06¼ @	.06½
U. S. P.—7, bbls.	lb.	.09½ @	.09¾
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.55 @	.65
Chrome	lb.	.14½ @	.15½
Mapico	lb.	.09½ @	—

BLACKS

(In bags, carload lots)

Aerfloted Arrow	lb.	.0265@	—
Certified	lb.	.0265@	—
Certified Spheron	lb.	.0265@	—
Continental	lb.	.0265@	—
Disperso	lb.	.0265@	—
Excello	lb.	.0265@	—
Fumonex	lb.	.03 @	—
Fumonex Beads	lb.	.03 @	—
Gastex	lb.	.03 @	—
Kosmobile	lb.	.0265@	—
Kosmobile 66	lb.	.0265@	—
Micronex (Amarillo)	lb.	.0265@	—
Micronex Beads (Amarillo)	lb.	.0265@	—
Pelletex	lb.	.03 @	—
P-33	lb.	.0475@	—
Supreme	lb.	.0265@	—
Thermax	lb.	.02 @	—
Wyex	lb.	.0265@	—

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10½ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	— @	—
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	9.50 @	—
Aerfloated, Suprex	ton	10.00 @	22.00
Crown (f.o.b. plant)	ton	10.00 @	—
Dixie	ton	10.00 @	24.50
Langford	ton	— @	8.50
McNamee	ton	10.00 @	22.50
Par	ton	10.00 @	22.50
Witco	ton	10.00 @	—
Cotton Flock (Dark)	lb.	.10½ @	.13
Glues, extra white	lb.	.28 @	.30
medium white	lb.	.14 @	.19
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
Kalvan	ton	95.00 @	121.00
Magnesium carbonate	lb.	.07½ @	—
Mica	ton	35.00 @	44.00
Mineralite	ton	— @	30.00
Pyrax A	ton	6.00 @	20.00
Rottenstone (powdered)	lb.	.02½ @	.05
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	25.00 @	45.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	6.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	—
Zinc Stearate	lb.	— @	—

MINERAL RUBBER

285°-300° Mineral Rubber	ton	23.00 @	42.00
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton	23.00 @	42.00
Parmr, solid	ton	21.00 @	27.00
Pioneer, MR, solid	ton		

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dor No. 5145	lb.	2.00 @	—
Areskleno No. 375 (dispersing, wetting and penetrating agent)	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.47
Santomerse S (dispersing, wetting, penetrating and stabilizing agent)	lb.	.11 @	.25
Sunproof	lb.	.22 @	.27
Sponge Paste	lb.	— @	.18
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.52 @	.61
Ty-Ply R (and S)	gal.	6.75 @	10.75

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.10¾ @	.13¼
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.08 @	.09
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	—
Alkalies			
Caustic Soda, 76%	cwt.	2.70 @	3.55
Soda Ash, 58%, C.L.	cwt.	— @	2.35
Oils			
Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06½
Palm Niger	lb.	.05½ @	.06½
Para-Flux	gal.	.17 @	.18
Para-Lube	lb.	.046 @	.048
Petrolatum, light	lb.	.03½ @	.03¾
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.64 @	.69
Rosin Oil, cmpd	gal.	.40 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rubtack	lb.	.08 @	.10
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin		— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	— @	—
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.50
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon tetrachloride	gal.	.73 @	1.065
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.41 @	.50
Ethylene dichloride	lb.	.06 @	.07
Plastogen	lb.	.07¼ @	.12
Reogen (drums)	lb.	.11½ @	.26
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	—
Trichlorethylene	lb.	— @	.08½
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¾ @	.11¼
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.50 @	1.95
Exel	lb.	1.00 @	1.40
Gel	lb.	.57 @	.73
Hipar	lb.	.65 @	.92
Powder	lb.	.52 @	.64
Resin	lb.	.52 @	.64
Resin D	lb.	.52 @	.64
White	lb.	1.25 @	1.60
Albasan	lb.	.70 @	.75
Antox	lb.	— @	.56
B-L-E	lb.	.52 @	.61
Flectol B	lb.	.52 @	.65
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone	lb.	.52 @	.63
Oxynone	lb.	.64 @	.80
Retardex	lb.	.35 @	.40
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.52 @	.61

MOLD LUBRICANTS

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mineralite	ton	— @	30.00
Mold Paste	lb.	.12 @	.18
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rusco, f.o.b. Nitro	lb.	.12 @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.17 @	—
Black	lb.	.08 @	.12
White	lb.	.08½ @	.12
Brown	lb.	.08 @	.10½
Neophax	lb.	.09¼ @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.04 @	—
Sulfur flour,			
Refined, 100% pure (bags)	cwt.	2.50 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

Crude Rubber — Latex & Guayule — Reclaim — Tires & Tubes — Automobiles — Rims — Gasoline — Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1939:							
Feb.	29,109	10,269,224	15.75	460	152,113	14.76	28,649
Mar.	43,490	15,058,279	15.46	439	171,279	17.43	43,051
Apr.	30,836	10,400,125	15.06	440	151,644	15.38	30,396
May	42,998	15,041,433	15.62	496	180,091	16.20	42,502
June	32,437	11,403,150	15.69	413	147,910	16.00	32,024
July	34,288	12,071,105	15.72	440	164,428	16.69	33,848
Aug.	35,794	12,702,958	15.84	267	89,741	15.01	35,527
Sept.	35,006	12,667,740	16.16	1,472	659,055	19.98	33,534
Oct.	42,784	15,211,621	15.87	5,886	2,881,172	21.85	36,898
Nov.	39,422	14,555,150	16.48	1,228	539,763	19.63	38,194
Dec.	68,384	25,861,354	16.88	1,116	529,759	21.20	67,268
1940:							
Jan.	68,962	26,314,500	17.03	955	447,673	20.92	68,007
Feb.	40,603	15,578,517	17.13	1,291	599,819	20.74	39,312
Mar.	55,517	21,845,290	17.57	975	447,460	20.49	54,542

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1922, however, include both latex and guayule; guayule only is included in 1923. Annual figures for 1922-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex (1) Tons	Liquid Latex (1) Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1939:								
Feb.	212	46,576	15	4,426	510	129,726	1,717	657,565
Mar.	229	39,520	14	5,215	641	136,112	2,005	731,302
Apr.	180	24,584	59	18,170	281	72,024	1,018	360,739
May	102	22,347	56	16,359	645	161,745	2,786	1,067,682
June	91	19,879	119	33,876	597	122,087	1,836	694,863
July	150	32,626	39	18,813	663	141,540	2,934	1,064,927
Aug.	178	38,687	28	8,689	742	208,156	2,614	1,001,013
Sept.	133	30,091	36	19,682	479	100,285	2,325	965,615
Oct.	282	61,376	107	43,267	465	127,084	2,555	968,207
Nov.	214	46,558	96	37,858	289	74,358	3,071	1,227,788
Dec.	236	51,521	64	38,781	477	126,548	2,779	1,127,924
1940:								
Jan.	128	27,901	34	19,478	612	155,570	3,410	1,412,728
Feb.	314	70,251	55	26,420	461	134,878	2,171	947,524
Mar.	365	81,181	45	20,895	542	162,493	3,376	1,473,056

(1) Weight given in pounds of dry rubber contained in latex.
Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

Figures on Monthly Basis

	1933	1934	1935	1936	1937	1938	1939	1940
Jan.	22,645	39,190	46,636	48,631	50,879	31,265	47,387	54,978
Feb.	21,392	40,515	42,720	36,841	51,950	25,357	43,422	49,832
Mar.	17,843	47,003	42,153	42,813	54,129	32,389	51,416	50,192
Apr.	25,928	44,853	44,247	52,031	51,859	29,730	45,268	.....
May	44,074	42,918	41,101	50,612	51,795	30,753	45,484	.....
June	50,743	40,147	36,156	52,772	51,860	32,540	48,438	.....
July	49,614	32,553	35,917	48,250	43,703	34,219	44,975	.....
Aug.	44,428	33,216	38,775	46,777	41,506	40,552	51,740	.....
Sept.	35,281	30,258	37,086	46,449	43,945	40,183	51,402	.....
Oct.	31,543	31,253	41,969	49,637	38,754	42,850	57,155	.....
Nov.	28,831	34,748	42,310	50,433	34,025	49,050	55,677	.....
Dec.	28,757	36,569	42,474	49,754	29,195	48,143	49,636	.....
Tot.	401,079	453,223	491,544	575,000	543,600	437,031	592,000	.....

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks	Year	Production	Consumption Tons	Consumption % to Crude	Stocks
1930	157,968	153,500	40.9	22,000	1935	122,948	117,523	23.9	17,000
1931	129,690	123,000	35.1	21,714	1936	150,571	141,486	24.6	19,000
1932	75,656	77,500	23.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250

Figures on Monthly Basis

1939:*									
Jan.	14,826	13,743	29.7	23,334	July	12,588	13,542	30.9	21,339
Feb.	14,102	13,347	31.5	23,461	Aug.	17,595	16,846	33.4	21,024
Mar.	15,647	16,197	32.3	22,155	Sept.	17,990	16,953	33.8	21,185
Apr.	14,527	13,391	30.3	22,628	Oct.	20,896	18,955	34.0	21,829
May	14,769	13,517	30.5	22,771	Nov.	20,755	18,006	33.2	22,362
June	15,871	14,870	31.4	23,058	Dec.	19,249	15,575	32.2	25,427
1940:									
Jan.	20,447	17,596	32.0	25,530	July	.....	.....	...	.....
Feb.	19,060	17,019	34.2	27,019	Aug.	.....	.....	...	.....
Mar.	18,266	17,560	35.0	26,221	Sept.	.....	.....	...	.....
Apr.	.....	.....	...	.....	Oct.	.....	.....	...	.....
May	.....	.....	...	.....	Nov.	.....	.....	...	.....
June	.....	.....	...	.....	Dec.	.....	.....	...	.....

Note: The above figures are based on the annual surveys conducted by the Leather and Rubber Division, Bureau of Foreign & Domestic Commerce, Washington, D. C., with the exception of those for the current year which are estimates made by the Rubber Manufacturers Association. They are revised frequently and the latest available issue should always be consulted for the most reliable figures. The annual figures are more accurate. Stocks shown are those on hand at the end of the indicated month or year.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1938	1939	1940		1938	1939	1940
January	35,323	37,767*	40,370	August	50,549	53,828*	.....
February	31,981	34,595	37,557	September	46,150	49,347	.....
March	41,409	42,520	44,607	October	46,365	49,687	.....
April	43,430	43,977	.....	November	45,084	47,275	.....
May	44,937	49,547	.....	December	41,742	43,694	.....
June	48,383	49,812	.....				
July	47,650	50,508	.....	Total	523,003	552,557*	.....

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964
1930	17,364,096	1934	12,255,118	1938	10,612,138
1931	11,253,800	1935	18,664,356	1939	17,471,914

1940		1940		1940	
January ...	2,163,914	May	.....	September ..	.....
February ..	1,850,383	June	.....	October ...	.....
March	1,918,241	July	.....	November ..	.....
April	1,822,686	August	.....	December ..	.....

ADVERTISING PAGES REMOVED

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1938																																
Feb.	14½	14⅞	14⅜	14⅜	14⅜	—	—	14⅜	14⅜	14⅜	14⅜	—	—	14⅞	14½	14¾	14⅛	14⅜	14⅜	—	14⅞	13⅝	—	14⅜	14⅜	14⅜	—	14⅜	—	—	—	14⅜
Mar.	14⅜	14⅛	14⅜	14½	14⅜	—	14⅜	14⅜	14⅜	14⅜	14⅜	14	—	14⅜	14⅜	14	14⅛	14⅜	13⅞	—	13¾	13¾	13⅞	13⅞	13⅞	14⅛	—	14⅛	13⅜	—	—	13½
April	10⅞	11⅜	11⅜	11½	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅜	11⅛	12⅛	12⅛	12⅜	—	11⅛	11⅛	12⅛	12⅛	12⅛	12⅜	12⅜	12⅛	12⅛	11⅞	11⅞	12⅛	11⅜	10⅛	10⅛	11⅜
May	—	11⅜	11⅜	—	11⅜	11⅜	11⅜	11⅜	11⅜	12	12	12⅛	12⅛	12⅜	—	11⅛	11⅛	12⅛	12⅜	12⅛	12⅛	12⅜	12⅜	11⅞	12⅜	11⅞	11⅞	11⅛	11⅜	11⅛	11⅜	11⅜
June	11⅜	11⅛	—	—	14⅜	16	—	15⅞	12⅛	12	14⅜	15⅜	15⅜	14⅞	15⅜	15⅜	12⅞	15⅜	15⅜	15⅜	15⅛	13⅜	13⅜	13⅛	15	15⅛	14⅞	13⅞	14⅛	14⅛	—	15⅜
July	15⅜	—	—	—	—	—	16⅜	—	—	—	—	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅜	15⅛	15⅜	16⅜	16⅛	16⅛	16⅛	16⅛	16⅜	16⅛	16⅛	16⅛	16⅜
August	15⅛	16⅛	15⅛	15⅛	16	16⅛	16⅛	16⅛	15⅜	15⅛	15⅛	15⅜	16⅛	16⅛	15⅜	15⅜	15⅜	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	15	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Sept.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Oct.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Nov.	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛	16⅛
Dec.	15⅞	15⅛	15⅛	15⅛	15⅛	15⅞	16⅛	15⅞	15⅛	16	—	15⅛	15⅞	16⅛	16⅛	16	16⅛	—	16⅛	16⅛	16⅛	16⅛	15⅞	15⅞	15⅛	15⅛	16⅛	15⅛	15⅛	16	16⅛	16⅛
1939																																
Jan.	—	—	16⅛	16⅛	16	16	16	—	15⅛	16	15⅛	15⅞	15⅛	15⅞	15⅞	15⅞	15⅜	15⅛	15⅛	15⅞	15⅜	—	—	15⅞	15⅜	15½	14⅛	15⅜	15⅜	15⅞	15⅜	15⅜
Feb.	15⅜	15⅜	15⅜	15⅛	—	15⅛	15⅞	15⅞	15⅜	15⅞	15½	15⅞	—	16½	16⅛	16⅛	15⅜	16⅛	—	16⅛	15⅜	15⅛	15⅛	16⅛	16⅛	16½	15⅛	16⅛	—	—	15⅜	16
March	16⅞	16⅞	16⅜	16⅛	16	15⅛	16⅛	—	15⅜	15⅞	16⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅛	15⅞	15⅞	15⅛	15⅛	15⅞	15⅞	15⅞	15⅞	16⅛	15⅞	15⅛	15⅛	15⅞
April	—	—	16	15⅛	16	16	—	16	16⅛	16⅛	16⅛	15⅛	16⅛	15⅛	15⅛	15⅛	16⅛	15⅛	16⅛	16	15⅞	16⅛	16⅛	16⅛	15⅞	16⅛	15⅞	15⅞	16	—	16⅛	16⅛
May	15⅜	15⅜	16⅜	16⅛	16	16⅜	—	16⅜	16⅛	16⅛	16⅜	16⅛	16⅜	16⅛	16⅛	16⅛	16⅛	16⅛	16⅜	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	15⅜	16⅜	16⅜	16⅜	16⅜
June	16⅜	16⅜	—	15⅛	—	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
July	—	—	16⅜	—	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
August	16⅜	16⅜	16⅜	16⅛	16⅛	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜	16⅜
September	19⅛	18¾	—	—	24	21½	19½	20	—	22	23	23¾	22	19½	22	22	20½	20½	21¾	21½	22	22	21¾	20¾	20¾	20¾	20	19⅜	20⅛	20⅛	20⅛	19⅞
October	20	—	19½	19⅛	19½	19½	19	—	19	19⅛	19¾	—	19¾	20⅛	—	20	20	20	20⅛	20	20	20	20	20	20	20	20	20	20	20	20	20⅛
November	20⅛	20⅛	20¼	20⅛	19⅞	20½	19⅞	20⅜	19⅜	20⅜	20⅜	20⅜	20½	20⅜	20	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅛	20⅛	20⅛	20⅜
December	20	20	—	19⅞	19⅞	19⅞	19⅞	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	19⅞	19⅞	19⅞	19⅞	19⅞	19⅞
1940																																
January	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	18⅞	19⅛	19⅛	19⅛	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	19
February	18¾	18¾	18¾	18¾	18¾	18¾	18¾	19⅛	19⅛	19¾	19¾	19¾	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	18⅞	19⅛	19⅛	19⅛	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞
March	18⅛	18⅛	18¾	18½	18¾	18¾	18¾	18¾	18¾	18¾	18¾	18¾	18⅝	—	18⅞	18⅞	18⅞	18⅞	18⅞	18⅝	18⅝	—	—	18⅞	18⅝	18⅝	18⅞	18⅞	18⅞	18⅞	18⅞	18⅞
April	18⅛	18⅛	18⅜	18⅜	18⅛	18⅛	18⅛	18⅛	19	19	19	18¾	18¾	—	19	19	19	19	19	19	18⅞	19½	19½	19½	19¼	19¼	19½	19½	19½	19½	19½	19½
May	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	20	20½	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	20⅜	—	20

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.59
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.70	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49

Average Monthly Price per Pound Since 1933

	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents
Jan.	3.08	9.32	13.10	14.35	21.37	14.63	15.75	19.06
Feb.	2.95	10.45	12.92	15.48	21.33	14.71	15.93	18.83
Mar.	3.01	11.01	11.51	15.89	24.09	13.55	16.26	18.58
Apr.	3.56	12.10	11.55	15.98	23.44	11.84	15.87	19.16
May	4.95	13.26	12.05	15.62	21.14	11.57	16.07	
June	6.15	13.51	12.57	15.85	19.29	12.57	16.37	
July	8.01	14.60	12.10	16.49	18.86	15.37	16.51	
Aug.	7.31	15.47	11.98	16.25	18.37	16.08	16.67	
Sept.	7.30	15.36	11.55	16.46	18.55	16.15	21.24	
Oct.	7.64	13.96	12.62	16.55	16.28	16.89	19.89	
Nov.	8.66	13.04	13.15	17.97	14.60	16.24	20.21	
Dec.	8.87	12.98	13.28	20.01	15.41	16.05	20.01	
Average for Year	5.96	12.92	12.37	16.41	19.39	14.64	17.57	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1940 Feb.	1940 Mar.	1940 Apr.	1940 May	Day	1940 Feb.	1940 Mar.	1940 Apr.	1940 May
1	11	12	11	11	17	—	—	11	
2	11	—	11⅛	11⅛	18	—	11	11	
3	—	—	11	11¼	19	13¼	11	11	
4	—	12⅜	10	—	20	13⅛	11	—	
5	11	12¼	10	—	21	12	11¼	—	
6	11	12¼	—	11⅜	22	12¾	—	10	
7	12⅛	12¾	—	11⅜	23	12¾	—	11	
8	12⅜	12⅛	10	11½	24	—	—	10	
9	12⅞	—	11⅛	11½	25	—	—	10	
10	—	—	11	—	26	13	11¼	10	
11	—	12⅛	11	—	27	12	11⅜	—	
12	12⅞	12	11	—	28	12⅝	11⅝	—	
13	12	11¾	—	—	29	12⅞	11⅛	10	
14	12¾	11⅜	—	—	30	—	—	10	
15	13⅛	11⅛	10	—	31	—	—	—	
16	13	—	10	—					

Average Monthly Price Per Pound

Month	1937 Pence	1938 Pence	1939 Pence	1940 Pence	Month	1937 Pence	1938 Pence	1939 Pence	1940 Pence
Jan.	10.378	7.077	7.926	11.793	Aug.	8.830	7.841	8.545	
Feb.	10.503	7.029	7.942	12.577	Sept.	8.935	7.918	9.634	
Mar.	11.766	6.590	8.120	11.651	Oct.	7.855	8.355	10.177	
Apr.	11.471	5.793	7.910	10.980	Nov.	7.080	8.111	11.210	
May	10.250	5.632	8.092		Dec.	7.332	8.005	11.559	
June	9.548	6.147	8.216		Average for Year.	9.424	7.164	8.959	
July	9.136	7.464	8.271						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1940 Mar.	1940 Apr.	1940 May	Date	1940 Mar.	1940 Apr.	1940 May	Date	1940 Mar.	1940 Apr.	1940 May
1	11.07	10.74	10.96	11	10.97	10.88		22	—	10.96	
2	10.95	10.73	10.93	12	10.96	10.89		23	—	10.99	
3	—	10.85	10.86	13	10.82	10.89		24	—	10.84	
4	11.08	10.84	10.84	14	10.88	—		25	10.79	10.89	
5	11.12	10.85	—	15	10.90	10.89		26	10.65	10.93	
6	11.03	10.84	10.74	16	10.77	10.94		27	10.73	10.98	
7	11.08	—	10.69	17	—	10.90		28	10.79	—	
8	11.08	10.88	10.67	18	10.72	10.91		29	10.79	10.94	
9	11.03	10.93	10.73	19	10.73	10.87		30	10.85	10.99	
10	—	10.92		20	10.87	10.91		31	—	—	
				21	10.84	—					

Average Monthly Price Per Pound

	1937 Cents	1938 Cents	1939 Cents	1940 Cents		1937 Cents	1938 Cents	1939 Cents	1940 Cents
Jan.	13.06	8.57	8.94	11.19	Aug.	10.41	8.41	9.30	
Feb.	13.15	8.91	8.97	11.10	Sept.	9.02	8.17	9.30	
Mar.	14.46	8.92	9.00	10.90	Oct.	8.42	8.61	9.24	
Apr.	14.23	8.76	8.87	10.89	Nov.	7.96	9.08	9.73	
May	13.34	8.50	9.56		Dec.	8.26	8.72	10.97	
June	12.70	8.38	9.88		Average for Year	11.44	8.66	9.46	
July	12.26	8.85	9.71						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of:	ON HAND 1938	1939	1940	AFLOAT 1938	1939	1940	ON HAND AND AFLOAT 1938	1939	1940
Jan.	276,497	223,879	156,830	57,356	48,210	90,285	333,853	272,089	247,115
Feb.	292,067	217,534	148,776	47,459	55,814	112,257	339,526	273,348	261,033
Mar.	301,762	205,936	149,678	41,882	55,981	113,619	343,644	261,917	263,297
Apr.	303,901	190,896		39,071	57,918		342,972	248,814	
May	300,907	193,602		32,859	54,046		333,766	247,648	
June	294,796	181,794		32,079	51,274		326,875	233,068	
July	282,785	174,240		40,400	52,990		323,185	227,230	
Aug.	273,841	161,362		47,772	66,717		321,613	228,079	
Sept.	268,094	150,171		48,927	68,310		317,021	218,481	
Oct.	259,074	133,183		51,062	100,500		310,136	233,683	
Nov.	242,592	118,535		51,114	114,044		293,706	232,579	
Dec.	231,500	140,280		45,105	91,095		276,605	231,375	

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1938	1939	1940	Liverpool 1938	1939	1940
January	40,203	51,420	12,000*	21,711	28,789	8,000*
February	46,596	48,312	10,000*	24,737	26,784	7,000*
March	50,233	46,768		26,220	24,996	
April	54,296	44,760		28,277	23,742	
May	57,194	43,454		29,862	22,211	
June	60,307	42,374		31,837	21,176	
July	62,336	37,772		32,825	19,116	
August	65,113	28,363		34,315	16,218	
September	63,321	24,965*		34,645	14,054*	
October	59,609	23,685*		33,483	13,336*	
November	57,794	23,244*		32,116	13,087*	
December	55,668	19,545*		31,012	11,006*	

* Estimated.

(Figures up to August, 1939, from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [2]	Ceylon [2]	Holland	Para and Manaos
At end of 1939					
January	30,975	59,155	4,827	198	1,557
February	28,559	59,399	4,318	183	1,826
March	23,255	58,005	3,389	137	2,244*
April	22,434	55,238	3,648	131	2,209
May	20,849	52,837*	4,005	136	1,966
June	19,563*	55,834	3,771	101	1,821
July	27,042	55,948	4,217	188	1,474
August	20,543*	50,625	3,134	315	1,914
September	23,457*	52,755	2,742	...	2,682
October	25,376*	46,264	3,335	...	3,419
November	22,957*	45,133	5,289	...	4,510
December	15,346	54,868	5,149	...	5,336
At end of 1940					
January	35,974	.....	5,755	...	2,862

[1] Dealers' and Port Stocks. [2] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

End of: 1939	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
March	55,981	25,200	20,819	102,000
April	57,918	27,200	13,882	99,000
May	54,046	25,700	16,254	96,000
June	51,274	25,260	11,466	88,000
July	52,990	31,000	21,010	105,000
August	66,717	30,000	23,283	120,000
September	68,310	30,000	35,690	134,000
October	100,500	35,000	37,500	173,000
November	114,044	35,000	21,956	171,000
December	91,095	35,000	25,905	152,000
End of: 1940				
January	90,285	35,000	49,715	175,000
February	112,257	40,000	40,743	193,000
March	113,619	40,000	57,381	211,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.

TOTAL PRINCIPAL WORLD STOCKS

(Figures from the Survey of Current Business)

At End of:	1935	1936	1937*	1938*	1939	1940
January	698,153	600,479	454,249	549,762	497,665	433,841
February	686,195	599,355	445,265	565,833	479,578	429,551
March	678,809	583,318	447,856	586,666	460,723	.....
April	677,006	567,172	428,249	586,291	438,252	.....
May	677,569	541,871	413,134	568,158	429,979	.....
June	671,525	520,255	434,250	573,136	407,640	.....
July	679,061	519,074	445,782	580,654	418,639	.....
August	680,644	500,520	457,462	565,394	397,345	.....
September	661,509	493,585	470,768	551,447	396,867	.....
October	655,000	486,159	479,398	540,976	413,274*	.....
November	617,300	466,491	493,266	512,196	395,217	.....
December	613,987	466,576	545,533	482,852	391,125	.....
Monthly Avge.	666,397	528,738	460,022	555,280	427,192	.....

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,635	13,437	13,355	11,376	15,565	7,314	13,946	14,918
Apr.-June	14,412	13,565	12,597	14,892	15,834	7,380	13,759	.....
July-Sept.	14,707	9,822	11,312	14,914	12,207	10,794	15,182	.....
Oct.-Dec.	9,550	10,406	12,099	14,858	9,704	12,360	14,726	.....
Total	45,304	47,230	49,363	56,040	53,310	37,848	67,613	.....

Shipment Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,981	10,730	11,154	10,554	14,143	7,388	12,445	12,746
Apr.-June	15,139	14,998	13,473	15,940	15,741	9,564	15,107	.....
July-Sept.	13,707	11,648	13,489	14,037	13,106	11,243	15,791	.....
Oct.-Dec.	8,265	9,310	12,066	12,855	10,495	12,098	14,165	.....
Total	44,092	46,686	50,182	53,386	53,485	40,293	57,508	.....

Inventory Figures[2]

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	7,290	11,651	11,675	8,762	12,004	10,547	9,963	10,836
Apr.-June	6,615	10,219	10,755	7,556	12,081	8,337	8,632	.....
July-Sept.	7,595	8,419	8,288	8,690	11,200	7,859	8,080	.....
Oct.-Dec.	8,888	9,455	8,196	10,717	10,383	8,166	8,665	.....

Figures for Recent Months

	PRODUCTION 1938	1939	1940	SHIPMENTS 1938	1939	1940	INVENTORY[2] 1938	1939	1940
Jan.	2,745	4,546	4,977	2,498	4,149	4,277	10,801	8,863	9,389
Feb.	2,195	4,309	4,911	2,342	3,731	4,118	10,559	9,475	10,157
Mar.	2,728	5,091	5,031	2,858	4,565	4,352	10,521	9,963	10,836

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.Mar.	6,230	12,823	12,553	11,891	15,831	7,314	12,383	12,897
Apr.-June	13,001	13,191	11,631	14,624	15,413	7,380	11,847	.....
July-Sept.	14,356	10,321	11,270	15,320	12,038	10,794	13,118	.....
Oct.-Dec.	9,000	9,891	12,425	15,201	9,092	12,360	13,300	.....
Total	42,587	46,226	47,879	57,036	52,374	37,848	50,648	.....

Shipment Figures on Quarterly Basis

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,539	10,640	11,252	11,367	14,606	7,387	11,422	11,750
Apr.-June	13,292	14,553	11,928	15,113	15,495	9,564	13,010	.....
July-Sept.	13,370	11,545	13,251	15,069	12,901	11,243	13,449	.....
Oct.-Dec.	8,189	8,306	11,636	12,874	9,765	12,099	13,309	.....
Total	41,390	45,044	48,067	54,423	52,767	40,293	51,190	.....

Inventory Figures[2]

Quarter	1933	1934	1935	1936	1937	1938	1939	1940
Jan.-Mar.	6,369	10,244	10,406	8,660	11,993	10,547	8,752	8,183
Apr.-June	6,097	8,795	10,050	8,075	11,833	8,337	7,549	.....
July-Sept.	7,008	7,639	7,565	8,595	11,326	7,859	7,206	.....
Oct.-Dec.	7,815	9,180	8,231	10,945	10,312	8,166	7,036	.....

Figures for Recent Months

	PRODUCTION 1938	1939	1940	SHIPMENTS 1938	1939	1940	INVENTORY[2] 1938	1939	1940
Jan.	2,516	4,097	4,287	2,527	3,943	3,827	10,582	7,932	7,634
Feb.	2,216	3,795	4,211	2,216	3,401	3,810	10,579	8,298	7,897
Mar.	2,583	4,492	4,400	2,645	4,078	4,352	10,547	8,752	8,183

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently and the latest available issue should be consulted for most reliable figures.
[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,316	108,806	46,510	3,732,608
1939							
July	209,343	150,738	58,605	9,135	5,112	4,023	218,478
Aug.	99,868	61,384	38,484	3,475	1,068	2,407	103,343
Sept.	188,751	161,625	27,126	3,921	3,494	427	192,672
Oct.*	313,377	251,819	61,558	11,296	7,791	3,505	324,673
Nov.*	351,782	285,252	66,530	16,756	9,882	6,874	368,538
Dec.	452,024	373,755	78,269	16,978	11,491	5,487	469,002
1940							
Jan.	432,101	362,736	69,365	17,213	12,579	4,634	449,314
Feb.	403,627	337,372	66,255	18,193	12,779	5,414	421,820
Mar.	423,299	352,473	70,826	16,612	12,025	4,587	439,911

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

ADVERTISING PAGES REMOVED

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]								NETHERLAND INDIES [4]						
	Gross Exports	Imports	Net Exports	Ceylon [2]	India & Burma [3]	Sarawak [3]	British North Borneo [3]	Thailand [3]	Java & Madura	Sumatra E. Coast	Other N. I.	Indo-China [3]	Amazon Valley	All Other [3]	World Total [5]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,765	7,856	406,432
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,368
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629
1939:															
Jan.	43,332	19,049	24,283	7,237	1,879	2,342	1,604	2,918	6,787	11,261	20,630	4,739	1,708	1,855	87,243
Feb.	43,084	13,889	29,195	5,495	1,565	1,484	664	5,606	4,833	8,410	11,752	5,659	1,056	1,754	77,473
Mar.	43,259	14,035	29,224	3,718	1,392	1,177	344	5,401	5,361	8,048	14,487	4,636	1,331	1,776	76,932
Apr.	43,658	13,996	29,662	2,225	1,260	2,446	1,687	2,660	5,321	9,250	13,768	2,581	1,139	1,753	73,751
May	42,214	12,697	29,517	2,805	1,670	1,649	558	2,782	4,105	8,168	12,155	4,585	874	1,672	70,540
June	31,541	9,567	21,974	3,708	1,435	1,157	332	1,748	5,839	8,846	12,824	4,030	591	1,825	64,309
July	45,962	20,052	25,910	5,019	1,285	3,092	1,603	5,599	5,229	11,020	19,431	3,367	1,019	1,804	84,378
Aug.	53,497	12,635	40,862	5,620	416	1,749	975	5,230	6,236	10,010	11,232	7,020	1,197	1,525	92,072
Sept.	45,094	18,302	26,792	6,064	780	1,932	429	4,670	5,168	10,278	22,270	5,943	1,131	1,832	87,289
Oct.	70,839	21,493	49,346	5,234	815	2,487	1,730	2,047	9,950	13,645	21,404	5,022	1,414	2,185	115,279
Nov.	49,276	13,657	35,619	4,405	819	2,023	1,322	1,428	5,827	10,239	14,163	6,540	1,055	2,191	85,631
Dec.	41,568	8,479	33,089	9,496	2,565	2,476	616	1,177	8,130	8,580	7,156	11,018	1,377	2,052	87,732
1940:															
Jan.	56,214	30,136	26,078	7,091	1,630	1,987	1,858	5,469	6,361	16,070	31,676	5,315	1,777	2,000*	107,212
Feb.	62,105	16,598	45,507	8,741	2,076	2,678	1,164	3,887	7,270	14,873	15,713	7,040	1,427	2,000*	112,376
Mar.	65,269	17,565	47,704	5,406	2,054	3,526	1,050	.....	.....	.....	.....	.....	.....	.....	.....

All figures from January, 1934, onward are net exports shown on a "dry rubber" basis as calculated by the International Rubber Regulation Committee. (1) Prior to January, 1934, Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex also is not included in the early years, which on a dry rubber basis was as follows: 1924—1,117 tons; 1925—3,618; 1926—3,263; 1927—2,439; 1928—2,247; 1929—3,574; 1930—2,750; 1931—1,940; 1932—5,193; 1933—10,470, and 1934—14,172 tons. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments on a dry rubber basis were: 1923—18 tons; 1924—90; 1925—6; 1926—20; 1927—½; 1928—1; 1929—2; 1930—11; 1931—2; 1932—2; 1933—1, and 1934—6 tons. (3) Official statistics. (4) Exports from "Other N. I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included in earlier years, which is as follows on a dry rubber basis: 1923—2,342 tons; 1924—1,008; 1925—2,239; 1926—44; 1927—84; 1928—1,395; 1929—437; 1930—2,744; 1931—3,874; 1932—3,488; 1933—5,260, and 1934—5,330 tons. (5) Calculated from official import statistics of principal consuming countries; also includes United States imports of guayule. (*) This total includes the third column for British Malaya and all other figures shown for other territories. (*) Figure is provisional.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,273	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1938:															
Nov.	32,567	936	5,322	7,275	3,123	4,665	1,984	4,000*	660	636	530	1,209	200*	379	63,486
Dec.	37,051	4,134	5,820	7,481	2,198	4,000	2,355	2,500*	647	876	263	1,013	200*	648	69,186
1939:															
Jan.	36,614	836	4,684	7,227	2,867	2,553	2,133	4,000*	910	898	454	1,037	200*	1,131	65,544
Feb.	30,578	4,773	5,315	7,569	1,451	3,263	2,025	2,000*	1,741	1,068	184	858	200*	524	61,549
Mar.	45,286	8,082	4,503	8,036	2,458	4,019	1,525	2,000*	1,316	1,242	368	1,133	200*	463	80,631
Apr.	31,590	4,752	5,639	8,719	1,466	3,579	1,926	2,000*	1,108	855	333	1,062	200*	597	63,826
May	45,390	7,531	4,646	8,413	3,006	4,438	1,573	2,000*	1,188	792	518	1,654	200*	618	81,967
June	33,951	8,439	4,649	8,190	2,423	3,067	1,992	2,000*	1,308	621	672	2,703	200*	487	70,702
July	36,932	4,040	4,282	8,437	3,164	3,668	1,350	1,000*	1,422	859	565	824	200*	412	67,155
Aug.	38,319	2,044	4,000*	....	2,033	3,145	1,500*	2,000*	2,182	952	651	1,546	200*	400*	58,972
Sept.	36,197	4,406	4,000*	....	2,639	9,254	1,500*	2,000*	875	108	222	1,200*	200*	...	63,572
Oct.	39,735	8,530	5,000*	....	3,787	2,749	1,500*	2,000*	1,235	519	653	1,200*	200*	...	69,589
Nov.	41,473	10,500*	5,000*	....	1,709	5,104	1,500*	2,000*	1,200*	667	613	1,200*	200*	...	71,504
Dec.	70,302	5,200*	5,000*	....	3,025	3,961	1,500*	2,000*	1,200*	1,035	1,827	1,200*	200*	...	94,702
1940:															
Jan.	71,519	450	5,000*	.....	5,047	4,527	1,500*	2,000*	1,200*	.....	682	1,200*	200*	.....	.....
Feb.	41,797	7,500	5,000*	.....	3,508	.....	.....	.....	.....	.....	495	1,200*	200*	.....	.....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE: THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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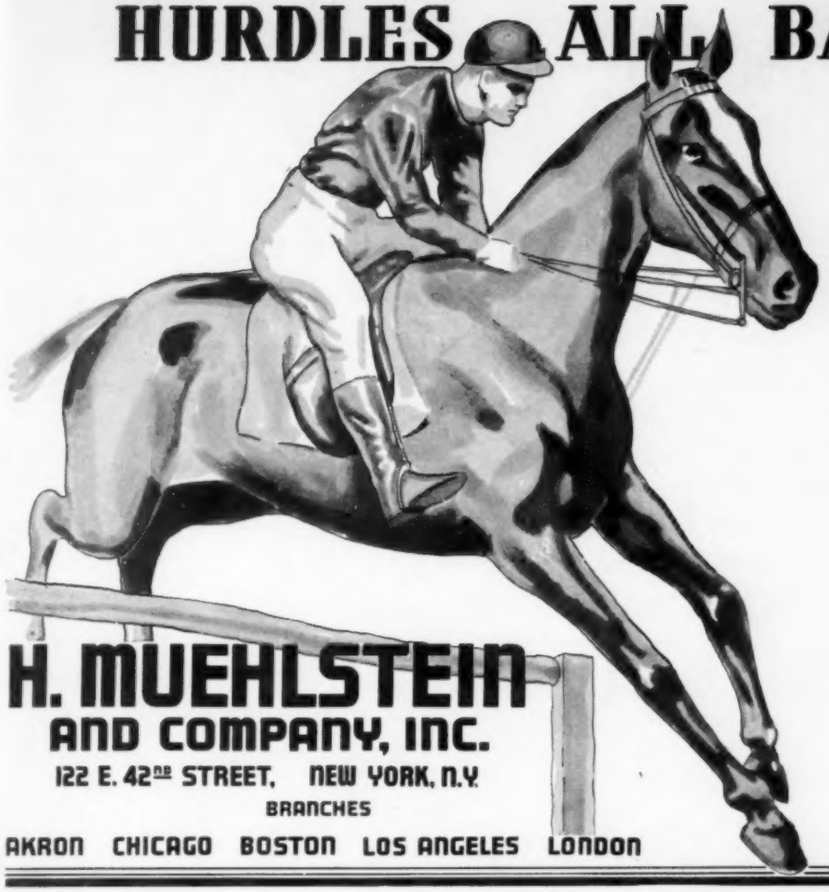

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Published on the 15th of each month by

PALMERTON PUBLISHING COMPANY, INC.

Printing office,
East Stroudsburg, Pa.

Editorial and Advertising Offices,
250 West 57th St., New York City

Entered as Second Class Matter, October 20, 1933 at the Post Office at East Stroudsburg, Pa., under Act of March 3, 1879. Subscription Rates: Domestic, $2.00 a year; Canada, $2.50; Foreign, $3.00. Single copies up to 3 months old, 25 cents; over 3 months old, 50 cents. Telephone COlumbus 5-2923, 5-2924. Contents Copyrighted 1940 by the Palmerton Publishing Company, Inc. Indexed in Industrial Arts Index. OFFICERS: P. L. Palmerton, President; E. D. Osborn, Vice-President and Secretary; Peter P. Pinto, Treasurer.